

AFRICAN RESEARCH UNIVERSITIES ALLIANCE (ARUA)

Towards developing a Collaborative PhD Program across ARUA Member Universities

*Experiences from the University of Ibadan and University of Lagos,
Nigeria*

**A Research Report Produced for ARUA by the
Human Sciences Research Council (HSRC)**

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1. Introduction to study and overview of country

1.1 Introduction to study

This report highlights the status of PhD education in Nigeria within the ARUA member universities. Two case studies, the University of Lagos and the University of Ibadan, are used to assess the nature of the PhD programmes and their structure and make recommendations towards the development of more collaborative PhD programmes within the universities, and across the ARUA network. The report provides an overview of the country's socio-economic status, which has a bearing on how universities organise PhD programmes, and which may influence the direction of the design of collaborative programmes as envisaged by ARUA. The report details the national and institutional policy and operational frameworks for PhD programmes in Nigeria and identifies some challenges facing collaboration within an internationalisation framework.

The report is divided into five sections. The next section provides a brief overview of Nigeria's socio-economic and political context. Section two provides a brief description of the Nigerian higher education landscape. Section three delves into the case study of the university and the two selected programmes. Section four presents the findings from the data collected from the two case study programmes. Section five presents some recommendations and a conclusion.

1.2 Socio-political context of the country

Nigeria, with a population of over 200 million people, and a total land area of 923 000 square kilometres is bordered by Niger and Chad to the north, Cameroon to the east, and the Republic of Benin to the west, with approximately 850 kilometres of coastline on the Gulf of Guinea to the south. It is divided into 36 States, plus the Federal Capital Territory (FCT), and is further subdivided into 774 Local Government Areas (LGAs). The States are grouped into six distinct regions — North Central, North East, North West, South East, South-South, and South West.

Nigeria is considered a lower-middle-income country with a national Gross Domestic Product (GDP) of US\$432.29billion and national per capita GDP of US\$2,097.09 as of 2020. While the country has made some progress in socio-economic terms in recent years, it is still ranked low in the human development category in the United Nation Development Programme's [2020 Human Development Index \(HDI\)](#), as it was ranked 161 out of 189 countries. The National Bureau of

Statistics (NBS) classified 40.1% of the total population as poor, and this translates to over 82.9 million Nigerians who live on less than US\$1 a day. This is considered poor by national standards.

Table 1: Country socio-economic statistics

National population	216 million
GDP per capita	US\$2,097.1
HDI	0.321 [161]
Unemployment rate	33.3%
Main economic sectors	Agriculture, Industry, Trade, Construction, Oil and Gas
Gross primary enrolment ratio	87%
Gross secondary enrolment ratio	44%
Gross tertiary enrolment ratio	10%
Number of public universities	106
Number of private universities	111
Name of participating universities	2 universities (Ibadan and Lagos)

1.3 Historical political landscape

Nigeria is a multi-ethnic, and culturally diverse, federation currently governed under a democratic dispensation. There are 18 registered political parties but the political landscape is dominated by the ruling All Progressives Congress party (APC) which controls the executive arm of government, and holds the majority of the seats in both the Senate and House of Representatives in parliament. They have 22 executive governors out of 36 State Governors.

1.4 Main economic /development policies

The economic growth of the country is driven by production and services across economic sectors such as agriculture, industry, trade, construction as well as oil and gas. Nigeria's National Development Plan (NDP) of 2021 to 2025, launched in December 2021, succeeds the Vision 20:2020 introduced in 2009, and the Economic Recovery and Growth Plan (ERGP), introduced in 2017. Both expired in 2020. The vision of the current NDP is to make Nigeria a country that has unlocked its potential in all sectors of the economy for sustainable, holistic, and inclusive national

development. The **broad objectives of the NDP cover** economic diversification, investment in infrastructure, security and good governance, an educated and healthy population, poverty alleviation, as well as economic and social development. One of the strategic objectives is to enable a vibrant, educated, and healthy populace.

Regarding the socio-economic state, inequality, in terms of income and opportunities, remains high, and has adversely affected poverty reduction. The unemployment rate is at 33.3% and the lack of job opportunities, along with regional inequality and social and political unrest, are at the core of the high poverty levels. High inflation has also taken a toll on the welfare of households, and high prices of commodities have been postulated to push additional millions of Nigerians into poverty.

A significant number of the youth in Nigeria earn their livelihood in the informal sector which accounts for 56.2% of the country's GDP. The informal sector has a high prevalence of small businesses and entrepreneurship in the country, and therefore, offers a good opportunity for our youth to be productive.

Although informal employment is expected to decrease in Nigeria, as the level of an individual's education increases, the formal sector is not growing at a similar pace to absorb its educated population. Therefore, a significant number of higher educated students are forced to remain in the informal sector to make a living.

2. Higher education landscape

2.1 Introduction

In Nigeria, the term Higher Education (HE) is referred to as Tertiary Education (TE). The National Policy on Education of the Federal Republic of Nigeria defines Tertiary Education as “the education given after secondary education in Universities, Colleges of Education, Polytechnics, Monotechnics including those institutions offering correspondence courses”. From the above definition, higher education is the one provided by: (1) universities, (2) colleges of education, (3) polytechnics, (4) monotechnics, and (5) other correspondence institutions.

The National University Commission (NUC) is the governing body that regulates the activities of accredited universities in Nigeria. Colleges of education are training centres for preparing young students interested in the teaching profession while the polytechnics provide specialised technical training and skill acquisition for students so they can contribute to the industrial and economic developments in Nigeria.

2.2 Size and shape of higher education

The Nigerian educational system was formerly structured using the 6-3-3-4 system, which entails one year pre-primary, six years primary, three years junior secondary, three years senior secondary and four years tertiary education. Tertiary education covers universities, polytechnics, and educational colleges. However, in 2008, the federal government introduced a nine-year basic education curriculum to achieve the goals of the universal basic education programme. Thus, the Nigerian educational structure became a 9-3-4 system, which entails nine years of basic education, three years of senior secondary school education and four years of tertiary education.

Currently, there are 217 universities in Nigeria comprising 106 public, and 111 private universities across the 36 states and the FCT. In 2015, the total tertiary enrolment at Nigerian universities was 1.9 million, and the total higher education enrolment in Nigeria has been projected to reach 4.8 million by 2024. The enrolment for doctoral programmes across the three categories of universities in Nigeria was 17 552 in 2019, comprising 71.9% in universities, 22.1% in state universities and 6% from private universities. Table 2 presents the summary of the higher education landscape in Nigeria.

Table 2: Higher education landscape in Nigeria

Name of Country	Nigeria
Gross primary enrolment ratio	87%
Gross secondary enrolment ratio	44%
Gross tertiary enrolment ratio	10%
Education expenditure as % of GDP.	7.12%
Number of public universities	106
Number of private universities	111
Number of Students enrolled for Postgraduate programmes	139,307 Masters=121,755; Doctoral=17,552
Name of participating university	University of Ibadan University of Lagos
Doctoral enrolment.	Federal Universities= 12618 State Universities= 3885 Private Universities= 1049 Total = 17552
Total number of doctoral enrolments (latest data)	University of Ibadan= 3507 University of Lagos= 658*
Number of PhD graduates (latest statistics)	University of Ibadan= 506 University of Lagos= NA

Source: NUC website, Statista 2022, WorldBank 2021 *Enrolment in the last four years

Several transformations have taken place within the Nigerian higher education sector concerning the availability of doctoral programmes. The number of private universities has grown significantly from three in early 2000 to 111 in 2022. Currently, up to 37 private universities offer postgraduate programmes, and only a few have started offering PhD programmes. Many public universities offer PhD programmes. The PhD programmes in Nigeria are thesis-based, with an expected completion time of not less than eight semesters (four years). The two ARUA universities are known to have recorded the highest number of doctoral students, and this is attributed to the track record of successful PhD graduations over the last five decades or more. Additionally, the first generation of universities have contributed significantly in the training of the current academic cadre and supporting capacity development across the higher education system.

3. Recap of the study and the case study PhD programmes

3.1 Recap of the study

The purpose of this report was to examine, in detail, three components of the PhD programmes of the two ARUA universities in Nigeria – access, programme structure and experience – as well as identify conditions that may facilitate the design of collaborative PhD programmes between the university and other member universities. Two programmes were selected for this purpose. While a set of criteria was proposed, the university had the discretion to suggest a preferred programme from the humanities and another from the natural sciences. The first approach was to select a programme in the science, technology, engineering, and mathematics (STEM) field under the ARUA Centres of Excellence (CoE). Data was collected from each of the programme coordinators or head of programmes. Institutional data was further collected from the institutional websites, and these were analysed according to three main themes: access to the programmes, structure of the programme and experience through the programme.

The research further sought to conduct interviews with the Vice-Chancellor of each university to gather inputs into four main issues related to collaboration: (1) national and institutional policy, (2) current collaboration practice, (3) challenges facing collaboration, and (4) recommendations for better collaboration. It must be noted that access to the data was a major challenge faced by the research team, particularly at the University of Lagos, with issues related to slow communication and lack of timely responses from key informants or administrative officials within the relevant postgraduate and research offices. Numerous attempts to meet with administrative and senior staff at the university were unsuccessful.

3.2 An overview of case study universities

There are two ARUA universities in Nigeria; the University of Ibadan (UI) and the University of Lagos (UNILAG) and these were selected for this case study. Both institutions are part of the five universities popularly known as [first-generation universities](#) in Nigeria.

The establishment of the University College Ibadan (UCI) in 1948, marked the beginning of fully-fledged higher education institutions in Nigeria. The university is now a comprehensive citadel of learning, with academic programmes in seventeen faculties namely, Arts, Science, Basic Medical

Sciences, Clinical Sciences, Agriculture, the Social Sciences, Education, Veterinary Medicine, Pharmacy, Technology, Law, Public Health, Dentistry, Economics, Renewable Natural Resources, Environmental Design and Management and Multidisciplinary Studies.

The UNILAG was founded in 1962 due to the need to intensify the training of a professional workforce for a newly independent Nigeria. The UNILAG currently has a School of Postgraduate Studies, a Distance Learning Institute (DLI), and twelve faculties, namely, Arts, Basic Medical Sciences, Business Administration, Clinical Sciences, Dental Sciences, Education, Engineering, Environmental Sciences, Law, Pharmacy, Science, and Social Sciences.

The scope of the evaluation is in two domains: the sciences and the humanities. In collaboration with the management of the two universities, the specific focus programmes in sciences and humanities were identified based on their admission and graduation rates in the last three academic sessions. Two PhD programmes, one each from the sciences and humanities, with the highest record of admission and graduation numbers were therefore selected. In addition to the two selected programmes, an additional PhD programme, hosted at the ARUA CoE at the UNILAG, was selected. The final selected programmes at both universities are;

1. University of Ibadan
 - a. PhD programme in Chemistry
 - b. PhD programme in Sociology
2. University of Lagos
 - a. PhD programme in Pharmaceutical Chemistry
 - b. PhD programme in Education Administration and Planning
 - c. PhD in Sustainable Urbanisation (ARUA CoE)

3.3 The case study programmes

3.3.1 Selected PhD programmes at the University of Ibadan

The entry requirements for PhD programmes at the UI are that candidates must have obtained a master's degree with a total weighted average of at least 60%. They could also have a Cumulative Grade Point Average (CGPA) of 5.0 in the relevant written examinations of a three-semester M.Sc programme. Candidates with MPhil degrees are also eligible to proceed into PhD programmes at the university. This implies that doctoral programmes are mostly restricted to candidates with

master's degrees and prerequisite scores in the field of research interest. This is mostly applicable to the two programmes of focus in the sciences (chemistry) and the humanities (sociology).

There are two modes of delivery for the PhD programmes: full-time and part-time. The average duration for full-time PhD students is four years with a minimum of three years and a maximum of five years. However, students have the privilege of a one-year extension at the end of the fifth year. If students are unable to complete their programme even after the extension, the university would advise the student to re-register. The appendix presents a step-by-step account of the procedure of the PhD programme at the UI, from application to completion.

The structure of the PhD programmes from application to completion substantiates the quality of the training and research of all the PhD students at the university. The PhD training at the university is mainly by research, thesis writing and oral defense of the thesis. Coursework is optional for PhD students, except if the students proceeded from an MPhil/PhD degree or such candidates wish to enrol for a non-credit bearing course that could further help in their research.

PhD in Chemistry

The Department of Chemistry is one of the foundation departments of the UI. Students were prepared for the general honours degree at that time, with the first graduates from the programme being produced in 1952. An honours degree programme in pure chemistry was introduced in 1953, while industrial chemistry was introduced in 1983. Hence, the Department can be regarded as the mother of all the chemistry departments in Nigerian universities. The department is known for having reputable academics who are recognised globally and locally for their contribution to science. Worth mentioning is the world-renowned Professor O Osibanjo who was ranked as the seventh most cited Nigeria scientist as per Google Scholar Webometric Citation for 2015.

The PhD programme in chemistry, involving thorough research activities started in 1950. Between 1950 and 1966, active research groups such as organic chemistry, physical chemistry, theoretical chemistry, biophysical, inorganic/organometallic chemistry, and analytical chemistry, emerged.

PhD programme in Sociology

The Department of Sociology originated as a sub-unit in the Department of Economics and Social Studies in the late 1950s. In 1960, a sub-department of Sociology was created within the Department of Economics. As the field of sociology expanded within the university, the process of developing a critical mass of indigenous sociologists involved the training of graduates of the department in Europe and North America. This was to expose them to a wide range of scholarships. Additionally, there was the recruitment of sociologists, anthropologists, and social psychologists that were not students of the department but who trained abroad. New sub-disciplines of medical sociology and medical anthropology, industrial sociology, criminology and Marxist sociology were added to the learning and research repertoire of the department by its new crop of scholars.

The Department of Sociology at UI runs both, undergraduate and postgraduate programmes, with more emphasis on the latter due to UI's vision of evolving into a mainly postgraduate degree awarding institution. The department offers conventional academic master's, professional masters, as well as PhD programmes. Currently, there are six units and tracks in the department, and these are, demography, medical sociology, industrial sociology, criminology, development, and political sociology. The department has a high staff quality; all the academic staff have obtained PhD degrees, and 33% are full-term professors. The philosophy of the department is to become an internationally recognised and vibrant center of research and teaching excellence, always at the cutting edge of sociological innovation.

3.3.2 PhD programmes at the University of Lagos

The three PhD programmes selected from the UNILAG were:

1. PhD in Pharmaceutical Chemistry in the department of Pharmaceutical Chemistry
2. PhD in Educational Management and Planning in the department of Educational Management
3. PhD in Sustainable Urbanization at the ARUA Centre of Excellence

The admission procedure into all the postgraduate programmes is fully online. The programmes are different in modes of study, and these include full-time, part-time and sandwich postgraduate programmes. All the postgraduate programmes are duly approved by the NUC, and they are

advertised in national daily newspapers. The procedures for the PhD programme at the UNILAG are presented in the appendix.

There are three main requirements for the award of the PhD programme for any candidate at the UNILAG. These are:

1. Passing written and/or practical examinations in the subject of the student's study programme.
2. Submission of a thesis and its acceptance by the examiners appointed for this purpose.
3. Passing of the oral defence on the subject of the thesis and related subjects.

PhD in Pharmaceutical Chemistry

The PhD programme in the Department of Pharmaceutical Chemistry started in 1984 with about three students. Since its inception, the department has trained and graduated over 32 students. The department in the current academic session has 12 students enrolled.

Following the increasing number of PhD graduates from the Department of Pharmaceutical Chemistry, research has evolved greatly from analytical and pharmaceutical analyses; drug synthesis and biological activities; as well as pharmacokinetics and biopharmaceutics studies to drug discovery and design of medicinal and therapeutic agents; nanotechnology; drug interaction; natural product chemistry; and phytomedicine. Graduates in the Department of Pharmaceutical Chemistry are known to be competent at conducting meaningful translational research, exchanging ideas, teaching and applying their knowledge and skills in order to solve emanating global pharmaceutical and medicinal challenges. The philosophy of the programme is to ensure standard and quality pharmaceutical education that provides adequate competence in various

PhD in Educational Management and Planning

The Faculty of Education was established in 1962 along with many departments such as, Adult Education, Curriculum Studies (now split into Arts and Social Science Education, and Science and Technology Education), Educational Administration (now Department of Educational Management), Educational Foundations (with Psychology), Physical and Health Education (now Human Kinetics and Health Education), and the Institute of Education (now Institute of Continuing

Education). The Department of Educational Administration came into existence in October 1975, with Curriculum Studies assuming the status of a different department. The Department of Educational Management, as it is known today, came into existence in October 2016.

PhD in Sustainable Urbanization

The PhD in Sustainable Urbanization was scheduled to be housed by the Centre for Housing and Sustainable Development.

Table 3: Summary of Data Collected from University of Ibadan

	HUMANITIES	STEM
Name of programme	PhD in Sociology with track in Demography Medical Sociology Industrial Sociology Criminology Development Political Sociology	PhD in Chemistry with track in Analytical Chemistry Organic Chemistry Physical Chemistry Inorganic Chemistry Industrial Chemistry
Academic home	Department of Sociology Faculty of the Social Sciences University of Ibadan	Department of Chemistry Faculty of Science
Access to the programme		
Entry requirement	Academic master's degree with PhD or MPhil/PhD grade in sociology, medical sociology, criminology, demography, and cognate disciplines.	MSc in Chemistry with PhD. An average of 60 percent or equivalent grade,(in CGPA), is required for admission
Last four year enrolment figures	2018= 143 2019=129 2020= Nil 2021=120	2018= 100 2019=129 2020= Nil 2021=66
Last four-year graduation figures	2018= 11 2019= 7 2020= 1 2021=29	2018= 5 2019=15 2020= 3 2021=13
Start and end date? Month	Varies with academic calendar and nature of research.	Varies with academic calendar and nature of research.
Application process? Open application, supervisor route, or funder calls? Interviews?	Open application via the PG College admission portal and submission of concept note.	Open Application

Programme cost	Varies - based on the scope of the candidates' research Tuition =US\$600/US\$5,000 per session	Tuition =US\$600/US\$5,000 per session
Structure of the programme		
Credit system?	The PhD programme is research-based and not course based. MPhil/PhD requires 60% from nine units before conversion to PhD.	The PhD programme is research-based and not course based. MPhil/PhD requires 60% from nine units before conversion to PhD.
Duration of programme	Average of four years Three-four years for full time Six years for part time Minimum of three years Maximum of seven years	Average of five years Four years for full time Six years for part time
Registration process	Application and registration is done online.	
Course design (thesis only or hybrid/paper)	Thesis-based	Thesis-based
Supervisory model	Supervisors are appointed based on the area of interest/scope of the concept of candidate.	<ul style="list-style-type: none"> • Students are encouraged to interact and discuss their research interests with potential supervisor(s). • ii. Supervisor will indicate willingness to supervise and officially inform the head of department through the co-ordinator of postgraduate matters.
Collaborative? How	Co-supervision is allowed within and outside the institution.	<ul style="list-style-type: none"> • Most of the PhD are collaborative in nature and design, hence co-supervision is common. • Co-supervision with researchers from other field currently exist in Microbiology, Geology, Pharmacy, Food Technology, Public Health, and Biochemistry. • Outside the country, we also supervise with researchers from China, India, Germany,

		UK, Pakistan and South Africa.
Graduation requirement (paper, etc)	<ul style="list-style-type: none"> • Upon field work, candidates are to present post-field seminar which is assessed for its adequacy and robustness. • Thereafter, the candidate proceeds to write an abstract. • Abstract is then approved at the Department, the Faculty and Post Graduate Board. • Upon approval of the abstract, candidate proceeds with the registration of title. • Then plagiarism test. • Thereafter, oral final defence in the Department. • Submission of final thesis to the PG college. 	<ul style="list-style-type: none"> • The student must apply for the programme. • A UI master's degree holder must have a PhD grade to be considered. • A master's degree holder from other universities with relevant qualifications must go through the MPhil/PhD conversion process on admission. • The application is screened at the departmental level. • On admission, the student is allocated to the supervisor(s) he/she had discussed his/her proposal with before applying. • Presentation of proposal at the unit level and commencement of field/laboratory work . • Presentation of experimental findings to the unit at the end of laboratory work. • Presentation to the department to enable other researchers evaluate the work (seminar). • Submission of abstract to the departmental abstract committee. • Submission of the certified abstract to the faculty abstract committee for approval. • Appointment of examiners (internal and external). • Defence of the PhD thesis.
Experience through the programme		
Quality of staff? % PhD / Professors?	100% of staff have PhD degree 33% are Professors	87.5% of staff have PhD degree 23% are Professors
Quality of infrastructure	Standard PG room Library	Each unit has its standard laboratory for research

(library, labs, ICT etc)		
Programme support (courses, funding, training etc)	PASGR (UI, Uni of Kenya, Uni of Pretoria)	More of individual collaborations and partnerships
Programme highlight. What makes it recognised?	<ul style="list-style-type: none"> • Highest PhD admission an graduation in the University • Track record of graduation • Produced several professors serving other universities • Many PhD graduates work with UN 	<ul style="list-style-type: none"> • Publications in top rated journals (high impact factors journals). • Patents in Industrial and Analytical Chemistry units. • Best Postgraduate College PhD thesis

4. Emerging findings from the data

This section presents findings from the analysis of the data collected from all the selected programmes. The findings are analysed along three main strands, access, structure and experience.

4.1 Findings from the University of Ibadan

The findings from the UI are presented separately from those of the UNILAG to maintain the institutional characteristics.

4.1.1 Access-related findings at the University of Ibadan

Access to the PhD programme in chemistry is on annual basis, however, the candidates must hold a master's degree with a PhD grade (total weighted average of at least 60% or a CGPA of 5.0 in the relevant written examinations of the three semesters of the MSc programme). The application for the programme is in the form of open application via the Postgraduate College admission portal and submission of a concept note. The cost of the programme stands at US\$600 and US\$5000 for national and international students respectively. Although candidates are not funded for the PhD programme, either in form of stipends or research support, opportunities for bench/laboratory work are often done outside the country, mostly Europe through the students' and supervisors' network. This implies that collaboration for PhD research is based on an individual's ability to gain access to external laboratory facilities. None of the recent research collaboration was with any university in Africa. Additionally, many of the PhD students were found to explore postdoctoral research opportunities mostly at the laboratories where their benchwork was conducted, and only a few returned to Africa. This brain drain is a challenge that the collaborative PhD among ARUA universities could address.

For the PhD programme in sociology, candidates are admitted based on their eligibility. To be eligible for admission, candidates must have obtained a master's degree with PhD or MPhil/PhD grades in any of the units in sociology or cognate disciplines. All the academic staff in the department are eligible to supervise PhD programme and this contributes to the high PhD enrolment rate figure in the department. The supervision model follows a "one student, one lecturer, model", and to ensure quality supervision and better research output, no supervisor can have more than nine PhD students allocated to them. Allocation of supervisors is done based on the candidate's area of interest, initial concept note, and availability of supervisors. A supervisor

may decide to discontinue the supervision of a student if he/she is not comfortable with the student's progress and vice-versa. Students are reassigned without victimisation.

4.1.2 Findings related to the Structure of the PhD programmes

The PhD programme in chemistry, as with other PhD programmes at the UI, is research-based, leading to the production of a dissertation. Candidates are not expected to undertake any course work except where the student wishes to include some courses in other areas to garner theoretical knowledge or practical skills that might be useful during his/her actual research engagement. Students with MPhi/PhD grades (CGPA 4 to 4.9) from their master's degree require 60% from nine units of coursework before a conversion into PhD research is possible. The average duration of a typical PhD at UI is five years; four years for a full-time programme and six years for a part-time programme. The flexibility to switch the mode of study from full-time to part-time, and vice-versa, makes room for employed PhD candidates to work and raise sufficient funds for their PhD research. The huge disparity between enrolment and graduation rates for PhD programme could be attributed to the fact that many of the students drop out of their programme due to their inability to meet the financial demands of their research.

The PhD programme in sociology is structured to be research-based as with other PhD programmes at the university (see Appendix). Students with MPhi/PhD grades (CGPA 4 to 4.9) from their master's degree are expected to undergo coursework of nine units before they can proceed to PhD research. The average duration of the PhD programme in sociology is four years and six years for full-time and part-time study modes respectively. The supervision of PhD students is based on research interests and concept notes presented by the student.

4.1.3 Experience of the PhD programme at the University of Ibadan

The way in which PhD students experience the programme is related to a number of indicators including, amongst others, the various forms of support they receive; availability of funding; the resources available, such as the laboratory and library among others; the supervisory model which supports throughput rates; as well as the opportunities for collaboration.

With over 30 lecturers (88% with PhDs and 23% being full professors), the department could be regarded as adequate in terms of PhD supervision. When appointing supervisors, students are encouraged to interact and discuss their research interests with their presumed potential

supervisors using the apprenticeship model. Other departments in the university, including Chemistry, adopt the concept of co-supervision, especially where the areas of research involve other disciplines beyond the research scope of the main supervisor. However, the main supervisor would be from the students' department. For instance, the Department of Chemistry collaborates with fields such as microbiology, geology, pharmacy, food technology, public health, and biochemistry. Collaboration has also been established with researchers from China, India, Germany, UK, and Pakistan. Many of these collaborations and partnerships are individually based.

Regarding access to infrastructure, there are five academic units in the Department of Chemistry, and each unit has its standard laboratory for research engagement as well as different research groups. Apart from the five standard laboratories in the department, the doctoral student can conduct further (advanced) analysis at the University Central Laboratory. The students also have access to several resources, textbooks, journal publications and e-books at the university's main library as well as the Faculty of Science Library.

In the last five years, a total of 293 students enrolled for the PhD programme across the five academic units in the department, with only 36 graduating from the department within the same time frame. Most of the recent PhD research was collaborative but these collaborations did not go beyond the supervision of doctoral students. Although a low level of research funding was recorded in the department, researchers have been able to sustain their research activities through individual collaborations and partnerships. Only PhD students whose research aligns with the existing collaboration benefit by either, access to the laboratories, or participation in relevant training or workshops. Overall, the experience of every PhD student, in terms of the duration and successful completion of the programme, is highly dependent on the availability of funding to the students to conduct laboratory analysis.

In the sociology programme, the average completion time is five years with only 48 of the 392 enrolled students graduating within the last five years. Apart from individual research grants, the only funding that postgraduate students benefit from is the Partnership for African Social and Governance Research (PASGR). The PASGR opportunity is in collaboration with the University of Kenya and the University of Pretoria, where five doctoral students were supported in the first year of the first cohort. The second cohort is in the enrolment phase of the programme. Although,

the department often encourages the students to obtain funding for their degrees, many of the current doctoral students are self-funded.

To provide the best study experience and better research output for the postgraduate students, the department has a well-furnished postgraduate laboratory with free internet connectivity. The students also have unrestricted access to the faculty and the university's main libraries. Regular training and workshops are organised by the department for the postgraduate students, especially those in the doctoral programmes. See appendix for the summary of the access, structure and experience of the selected PhD programmes at the UI.

4.2 Findings emerging from the University of Lagos

Three programmes were selected from the University of Lagos. One of these was the Centre of Excellence in Sustainable Urbanization.

4.2.1 Access-related findings

For a candidate to be considered for admission to the PhD in Pharmaceutical Chemistry, the student must have obtained a master's degree in Pharmaceutical Chemistry, with a minimum of four out of five GPA. Candidates with an MPhil degree in Pharmaceutical Chemistry, who have passed 10 units of coursework, are eligible to proceed to the PhD programme. All 30 academic staff in the department have PhD degrees and 41% are professors. The current student-staff ratio is 2:1.

Candidates admitted into the PhD in Pharmaceutical Chemistry programme at the UNILAG could specialise in any of the following fields of research; medicinal chemistry/drug design, medicinal chemistry of natural products, isolation and structure elucidation of medicinal agents of natural origin, development of new methods in pharmaceutical analysis, synthesis of nanoparticles for targeted drug delivery, pharmacokinetics, and metabolic studies.

Supervisors are appointed to doctoral students by the postgraduate school based on the recommendation from the appropriate department and the candidate's research specialisation. The appointed supervisors must have a minimum of three years of post-doctoral research and teaching experience. According to the university's regulations, where there is more than one supervisor, one of them shall be designated as the major supervisor. The maximum number of PhD supervision by each supervisor shall not exceed six.

To be admitted into the PhD programme in the Department of Educational Management, a candidate must possess a master's degree in Educational Administration and Planning with a minimum of a four out of five GPA or a MPhil degree in Educational Administration and Planning with a minimum of a four out of five GPA.

The application for the enrolment of the first cohort of students into the PhD in Sustainable Urbanisation in the Centre of Excellence is ongoing, and no candidate has been offered admission yet. To be considered for admission, all requirements, as stipulated in the regulations of the university's School of Postgraduate Studies, must be met. Additionally, candidates for the programme are required to undergo a selection process to ensure that their research proposal addresses one of the sustainable development goals (SDGs) and is relevant to at least one of the eight research clusters of the Centre for Housing and Sustainable Development. Furthermore, candidates must have a master's degree, with a minimum GPA of four or an MPhil degree with a minimum GPA of four from the UNILAG, or any other recognised university in any of the following disciplines, sustainable urbanisation, housing development and management, urban management, facility management, construction management, project management, and built environment disciplines (architecture, urban and regional planning, estate management, land economy, quantity surveying, building, landscape architecture, land surveying and geographic information systems). Holders of master's degrees in social science disciplines and interdisciplinary studies are also eligible to undergo the PhD in Sustainable Urbanization.

4.2.2 Structure related findings

The structure of the PhD programme at the UNILAG is hybrid in design, with both coursework and research components. The course component of the PhD programme was designed to address any academic shortcomings during the master's programme and expose the students to recent advances in the field of pharmaceutical chemistry, especially as it relates to the field of research.

The PhD in Sustainable Urbanization programme is designed such that the candidates will undertake a minimum of 30 credit units, which comprise 12 units of coursework, six units of seminars, and 12 units of a dissertation before graduation. This new PhD programme is a German Academic Exchange Service (DAAD) funded SDG Graduate School Programme (which is a partnership between the University of Witwatersrand, Technical University Berlin and University

of Lagos) as well as the UK Research and Innovation (UKRI) funded African Research Network on Urbanization and Habitable Cities (a coalition of 10 African universities and four UK universities). This collaborative PhD programme is the first of its kind in Africa, with its primary objectives being to address the 17 SDGs.

The centre is adequately equipped with all the physical and digital infrastructure required for the smooth completion of the programme. The centre also hosts the UNILAG Urban Laboratory which currently has four funded PhDs from the Economic Community of West African States (ECOWAS) sub-region.

4.2.3 Experience of PhD in the Department of Pharmaceutical Chemistry

As mentioned earlier, experience through the PhD programme is determined by a number of indicators. In the Pharmaceutical Chemistry programme, the department has a standard library with over 50 books in addition to the Faculty of Pharmacy and College of Medicine libraries with over 150 and 2000 books in the field of pharmacy respectively. Numerous e-resources are also accessible with the UNILAG IP address. The quality of research outputs is ensured by the four standard, and adequately equipped, laboratories present in the department, 11 office spaces, and two lecture rooms. The department also has access to the Drug Centre and ICT support in the Faculty of Pharmacy.

In the last five years, up to 12 students enrolled for the PhD in Pharmaceutical Chemistry, with seven completing their programme. In terms of funding and support, the department has benefited from several funding opportunities which have contributed significantly to the PhD experience of the students. Such funding opportunities include; Australian Research Council Occupational Trainee Grant; Chinese Postdoctoral Science Foundation/China Africa Science and Technology Transfer Program (CASTEP) grant; National Natural Science Foundation Research of China split-site research grant; Tertiary Education Trust Fund (TETFUND); National Research Fund; Central Research Fund; Multiple Royal Society of Chemistry UK Grants; Africa Oxford Initiative, and the UK grant on Instrumentation. Recently, the department in collaboration with other faculty members and departments within the university, attracted the World Bank African Centre of Excellence Multibillion Grant.

In the Educational Management programme, a total of 28 enrolments and 25 graduations have been recorded for the PhD programme in the last five years. This indicates a very high throughput rate. A total of 16 academic staff are available for the supervision of PhDs with 50% of the staff on professorial level. The current student staff ratio stands at 1:5. As indicated in the regulation by the School of Postgraduate Studies, supervisors are appointed to a student based on the area of research interest and the scope of the concept note by the students. The main funding source for students is through state and national bursaries, and self-funding as many of the candidates are working, either as teachers/lecturers or school managers.

Ahead of the commencement of the PhD in Sustainable Urbanization, 21 academic staff have been engaged at the Centre. All of them have a PhD degrees with 80% at professorial level.

5. Recommendations and conclusions

The findings from the selected programmes in the two ARUA universities in Nigeria have been presented along the three main themes of access, structure and experience. Based on these, a number of recommendations are proposed across a range of stakeholders towards bettering doctoral programmes and enhancing collaboration within the alliance.

5.1 Recommendations from the case studies

Five recognitions are proposed in this section which relate to the national system level, some at institutional level and others related to specific programmes.

5.1.1 Formulation of higher education and regulatory policy

There is a need for a national policy on higher education that centres around the country's research agenda. Although each university has its individual research policy, the lack of a clearly articulated national outlook for research in higher education makes collaboration among Nigerian universities more difficult to attain. The absence of a national policy is responsible for the lack of single collaborative programmes among over 200 universities in the country. A national policy concertation drive is needed to achieve significant stride in any form of collaborative programme in Nigeria. The NUC is saddled with the responsibility of accrediting all programmes across all levels in Nigerian universities with the Governing Council of each university serving as the governing authority that is responsible for policy decisions at their university. This has implications for the general management of the affairs of the university.

Therefore, there is a need to consider the regulations of the NUC and the university senate, particularly regarding the procedures and policy frameworks that govern collaboration with other universities towards admission and graduation of PhDs. The stakeholders from UI and UNILAG indicated that a systematic bottom-up approach from the departmental/programme level, through to the institutional level, and to the policy and regulatory level, should be considered in the planning and implementation of any collaborative PhD.

5.1.2 Funding of research

Research funding of Nigerian universities has been on the decline, with many researchers relying on individual funding opportunities and external collaborations for their research engagements.

This has greatly influenced the scope and research direction as the research focus is expected to align with the broad objectives of the funders. The Departments of Chemistry and Pharmaceutical Chemistry in UI and UNILAG respectively, attest to how the direction of COVID-related research was influenced by the preferences of the funding organisations. Inadequacy of research funding was identified as a key reason for the high number of mobility/ travel requests for the completion of the bench work mostly outside Africa. This, however, can serve as an impetus for collaborative PhD programmes with universities both within, and outside, Africa.

While the enrolment for PhD degrees is on the rise, the completion rate continues to drop. The challenge is not with the structure or access to the PhD programmes, but the experience due to the inability of the students to sustain the continuous self-funding of their research. This was attributed to the Nigerian government's inability to commit to a reasonable amount of funding support for research. h

Through collaborative PhD research, stakeholders from the UI and UNILAG revealed that the financial burden may reduce significantly, thus leading to much higher graduation rates of the PhD students.

5.1.3 Potential for internationalisation and student and staff exchanges

The number of international students at Nigerian universities, both in humanities and natural sciences are low. Internationalisation of programmes is one of the targets of management at universities. For instance, two percent of the admission quota has been earmarked for international students, and there is the long-term goal of increasing it to 10 percent. The agenda for the internationalisation of Nigerian universities is achievable.

In as much as student and staff exchange programmes are in existence, the record of such an exchange programme is more with foreign universities in Europe and Asia. In the department of Pharmaceutical Chemistry (UNILAG) and the department of Chemistry (UI), there are many students and staff exchanges that have been established, with certain institutions serving as host universities in the last two decades. This has contributed significantly to research output and the ranking of these universities. Through the collaborative PhD among African universities, more quality research output is guaranteed. Additionally, this will boost international networking opportunities and create room for multi-country collaborations among early career researchers, especially among those in ARUA member universities.

Furthermore, through collaboration, there will be more room for programme-based workshops and conferences within the ARUA network. An example of such has been structured in the PhD programme of the ARUA CoE at UNILAG.

5.1.4 Readiness for PhD collaboration

The UI and UNILAG unanimously see the need for a collaborative PhD within the ARUA university network, indicating their willingness to adopt a programme of this nature that will promote the quality and scope of their research output. The Department of Sociology at the UI revealed that their first doctoral programme was collaborative in design. They highlighted that co-supervision, as well as the partnership with researchers, within and outside the two institutions, has been common practice across all the programmes. This implies that implementation of a collaborative PhD programme will not be difficult to implement as long as the extant rules and regulations of all the universities are adhered to.

Although neither the education policy nor the NDP explicitly indicated the essence of collaboration for research advancement, especially for doctoral studies, the UI and UNILAG have recorded few collaborative PhD research efforts. For instance, a collaborative programme for 16 programmes both at master's and PhD levels exist between the UI and the Pan African University for Life and Earth Sciences Institute (PAULESI). There is also a DAAD and UKRI-funded collaborative PhD programme between the University of Witwatersrand, Technical University Berlin and UNILAG. Furthermore, the African Research Network on Urbanization and Habitable Cities (coalition of Ten African Universities and four UK universities) is currently receiving the application for the first cohort of its PhD researchers. The implication of the existing collaborations is that initiating a collaborative PhD to further enhance research quality will not be strange to either of the two ARUA universities in Nigeria.

5.1.5 Need for harmonisation of the curriculum

While there is no existing collaborative PhD in four out of the five cases at the UI and UNILAG, the four departments were positively willing and indicated their readiness to initiate the process of collaborative PhD programmes. It was suggested that the process start with the harmonisation of curricula, considering the peculiarity of each university's policy and structure of PhD programmes. Such harmonisation should be structured to adequately identify and integrate the scope and research advances of the programmes of interest across ARUA universities. For example, the

thesis-based system is used at the UI, while the UNILAG adopts a hybrid approach of course work and thesis. Additionally, due approval must be sought from the university's senate and governing councils.

5.2 Conclusion

The UI and UNILAG strongly indicated a willingness to collaborate with other African universities on their PhD programmes. This form of collaboration is expected to foster better research output, visibility from, and within Africa, better opportunities and access to funding for PhD programmes, reduce isolated research, and increase multi-country research.

Appendices

African Research Universities Alliance (ARUA)

Data Collection Instrument: Doctoral Degree Programme

Summary of data collected from the University of Lagos

	HUMANITIES 1	STEM	STEM
Name of programme	PhD in Educational Administration and Planning	PhD in Sustainable Urbanization	PhD in Pharmaceutical Chemistry
Academic home	Department of Educational Management	Centre for Housing and Sustainable Development	Department of Pharmaceutical Chemistry
Access to the programme			
Entry requirement	MSc in EAP (minimum of four of five GPA)	MSc in any of the following field: Sustainable Urbanization Built Environment disciplines (URP, Estate Mgt, Land Economy, Quantity Surveying, Land Surveying, Landscape Architecture, and GIS) Social Science Other interdisciplinary studies	MSc in Pharm Chem. (minimum of four of five GPA) MPhil in Pharm Chem +10 units coursework
Last four-year enrolment figures	28	Nil	12
Last four-year graduation figures	25		Seven
Start and end date? Month	Varies with academic calendar and nature of research		Varies with academic calendar and nature of research
Programme cost	Varies based on the scope of the candidates' research Tuition only =US\$540 per session		
Structure of the programme			

Credit system?	Yes	Yes	Yes
Duration of programme	Average of six semesters for full time (three years) Average of eight semesters for part time (eight years)		Minimum of six semesters Maximum 10 semesters
Registration process		Application and registration are done online However, PhD in SU must address one of the 17 SDGs	
Course design (thesis only or hybrid/paper)	Course and Thesis-based		
Supervisory model	Supervisors are appointed based on the area of interest/scope of the concept of the candidate Co-supervision exist for all the three programmes		
Collaborative? How	Co-supervision is allowed within and outside the institution but there is no current collaboration regards outside the University	The PhD programme is a DAAD funded SDGs Graduate School programme	Host the World Bank CoE Collaborative research exists but mostly on individual basis
Experience through the programme			
Quality of staff? % PhD / Professors?	100% of staff have PhD degree 50% are professors 33% are professors	100% of staff have PhD degree 80% are professors	100% of staff have PhD degree 41% are professors
Quality of infrastructure (library, labs, ICT etc)	Adequate infrastructures are available for the three PhD programmes There are standard lecture rooms, laboratories, and well equipped libraries		
Programme support (courses, funding, training etc)	Little funding Most students are on self-funding	Fully funded	Funding are mainly from individual collaborations and partnerships

<p>Programme highlight. What makes it recognised?</p>	<ul style="list-style-type: none"> • Has one of the highest enrolment and graduation rate in the University • Track record of graduation 	<p>The ARUA CoE is at its early stage of its PhD programme</p>	<ul style="list-style-type: none"> • Most sought after PhD programme in the university • Reasonable completion time • International recognition
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Appendix: Data gathering instrument

African Research Universities Alliance (ARUA)

Data Collection Instrument: Doctoral Degree Programme

Towards a Collaborative PhD Program across ARUA member universities

in the Natural Sciences and the Humanities and Social Science Disciplines

Compiled by [Name of researcher(s)]

Please note: This data collection instrument must be completed for every programme separately. [One for the natural science programme and another for the Humanities /social science programme]

- a. Name of the university where the degree is offered

Programme-specific information:

- b. Name of the faculty/school and department/centre/institute where the degree is offered
- c. Exact name of the degree programme and qualification
- d. Number of credits (total; elements)
- e. Number of students/candidates enrolled in the degree programme over the last 5 years (number of enrolled PhDs)
- f. Academic staff available for supervision / staff to student ratio
- g. Qualification of staff (% PhD, % professors)
- h. Graduation number in the degree programme over the last 5 years
- i. Availability of supporting infrastructure, including institution-wide infrastructure (library; ICT support; statistics support; research hub; writing centres etc.); faculty-wide infrastructure / department / centre (e.g. laboratories, studios, postgraduate academies); and programme specific infrastructure (if any).
- j. Is this a collaborative programme (with another institute/university)? If yes, please elaborate on any relevant aspect.
- k. What is the history of this programme? (date started, how it might have changed with time)
- l. What makes this programme one of the best? Any notable graduates, ranking achievements, patents or so (or other 'bragging rights' or significant achievements or recognitions worth mentioning)?

Admission requirements

- m. Minimum prior qualification plus other requirements (e.g. masters GPA or score average points/merits; work experience; professional registration, or the like)
- n. Application date & start date of programme (deadlines)
- o. Formal application procedure and requirements for supporting documents (e.g. PhD proposal; CV; sample writing; etc.)
- p. Contacting and assignment of supervisor(s)

- q. Please comment: Are these admission requirements typical for all doctoral programmes nationally, in this institution, or are they specific to the HUM or STEM, or are they unique to this particular programme?

Structure and content of programme

- r. Assignment of supervisor and supervision model
- i. one student-one supervisor (traditional / apprenticeship model);
 - ii. one student-several supervisors (team supervision model);
 - iii. many students-several supervisors (cohort supervision)
 - iv. is there a contract between supervisor and student?
- s. Collaborative supervision aspects and other research support (e.g. joint cohort research days; postgraduate academies; etc.)
- t. Provisional vs. full registration rules e.g. Is there a period when one is provisionally admitted pending some procedures? such as proposal presentation and acceptance, title registration;

Programme requirements:

- u. Compulsory elements (e.g. compulsory orientation; compulsory course work; minimum lab work; seminar attendance; residency requirements; professional work/internship requirement; field work requirements;)
- v. Other elements, e.g. exchange programmes
- w. Milestones and outputs of the programme:
- i. Requirement to present (inhouse or at a conference)
 - ii. Requirement to publish (type and number of minimum publications)
 - iii. Thesis by monograph, by professional capstone, by articles (explain all in detail)
- x. Duration of the programme: Minimum time to graduation; maximum time to graduation
- y. Financial obligations and benefits
- z. Costs of the programme (per annum; overall)
- aa. Funding opportunities: availability of sponsorship, bursaries, scholarships, assistantships; tutoring/lecturing; etc.
- bb. Conference attendance (e.g. availability of sponsorship)

Assessment of this programme

- cc. Please comment: Is this structure and content of the programme typical for all doctoral programmes in this institution, or are they specific to the HUM or STEM, or are they unique to this particular programme?
- dd. Please comment on the programme's comparability with other doctoral programmes you are familiar with.
- ee. Please comment on best practices or the need to modify.
- ff. What could be done to make the programme more harmonized with others within ARUA universities.

Please use the reporting tool to collect and compile additional information on (1) the country and national higher education system; (2) doctoral degree rules (national) in the country and related information; (3) the institutional background (university).

