



## Promoting and Sustaining a Virile Statistical Laboratory in Nigeria's Premier University: Lesson from UI-LISA Experience

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### Abstract

Despite the University of Ibadan being the first university in Nigeria, with a very rich history starting in 1948 as an independent college of the University of London, the idea of having an interdisciplinary statistical laboratory was never considered. Patronage for statistical advice and counseling by non-statisticians was very rare and statistical collaboration between statisticians and non-statisticians in the university was very low if it existed at all. Even with the establishment of a Department of Statistics over forty years ago, most statistics courses are taught by lecturers with minimal academic qualifications in statistics. Prior to the establishment of the interdisciplinary statistical laboratory, now popularly called UI-LISA, our students were exposed only to the theoretical aspects of statistical training with illustrations drawn mostly with data used in foreign textbooks. The students have always expressed concerns about the practicability and relevance of many of the courses and topics covered in their classes. The numerous university research community members have had to struggle to understand and use statistical tools needed for their research, sometimes leading to serious abuse of the procedures or drawing invalid and twisted inferences. The establishment of UI-LISA and its official recognition as a member of the LISA 2020 Network has not only rejuvenated statistical collaboration in Nigeria's premier university but has increased the enthusiasm of our statistical collaborators and student populace. Three programmes were ingeniously designed to change the tide. First, the *Weekly One-hour with a Statistician* programme offers one hour interactive lectures to the university community focusing on some popular statistical methods often misused by students and researchers. Second, the *Mobile Statistical Clinic* involves a team of statisticians going to public locations such as conference areas, halls of residence, etc to educate and provide on-the-spot solutions to problems and enquiries related to statistics. The third programme is a series of *Collaborative Training Workshops* organized jointly with departments, centres, faculties, institutes, and units within and outside the university on any aspect of statistical methodology peculiar to them. In this presentation, the experience of UI-LISA in the implementation of these three programmes will be discussed including the ongoing collaboration with the Centre for Petroleum Energy Economics and Law (CPEEL) to study household energy saving behavior, energy billing systems, and modern energy penetration in a semi-urban community in Nigeria.

**Keywords:** statistical laboratory; statistical collaboration; statistical literacy; interdisciplinary statistical analysis.

### 1. Introduction

The most prestigious and oldest university in Nigeria is the University of Ibadan popularly called UI. The rich history of nearly seventy years which started as a college of the University of London and as a full-fledged independent university about 45 years ago continues to be its greatest pride. It is not only the foremost producer of high-level manpower resources for Nigeria but also for the West African sub-region. The university also prides itself as the front-runner in research for development and as a flagship of postgraduate training in Africa. With over 478 postgraduate programmes, an annual average postgraduate students' population of 15,000 and an annual doctoral graduation of about 250, the university is globally recognized as a leading postgraduate institution in Africa (University of Ibadan (2014)).



The road to statistical learning in Nigeria began in 1965 when the first Department of Statistics was established by the Senate of the University of Ibadan. The initial primary emphasis of the Department was the production of statisticians to reduce the critical manpower shortage and the offering of service courses to other teaching or research units of the University. The Department, in collaboration with the defunct Federal Office of Statistics (FOS), engaged in Professional Diploma in Statistics (PDS) and the Professional Postgraduate Diploma in Statistics (PGDS) programmes to build statistical capacity for the staff of FOS nationwide. The major preoccupation of the department was the production of graduates that were knowledgeable in statistical techniques with ability to reason, conceive ideas, formulate theories, interpret, transform and apply statistical sciences in all phases of life.

Despite the existence of the Department of Statistics in the University, the training of statisticians is plagued with several problems. First, the curriculum emphasizes the production of graduates who could apply statistical science independently but with limited orientation on how to collaborate with non-statisticians in other fields. Second, statistical infrastructure such as statistical laboratory where students can be exposed to both the technical and non-technical components of statistical trainings is non-existent. By technical trainings, it is meant statistical theories, methods, computing, etc while the non-technical include the skills required to communicate effectively with non-statisticians. Third, interdisciplinary collaboration is virtually non-existent. By nature and practice, statistical profession is domain neutral and heavily connected to all disciplines whether arts, science, social science, engineering, agriculture, etc. Apart from providing service courses to other departments and units, there are virtually no research collaboration or provision of any statistical support services to researchers in the university community.

The training of statisticians at U.I had been constrained by the three problems listed above until the intervention of the Laboratory for Interdisciplinary Statistical Analysis 2020 (LISA 2020) Global Network. The U.I. LISA (UI-LISA) was established in March 2015 and officially became a member of the LISA 2020 Network on 4 June 2015. The activities of the Lab include: engaging in statistical collaboration with researchers in various disciplines in humanities, arts, sciences, engineering, education, medicine etc to produce co-authored publications in journals with high impact factor; providing walk-in consultation for quick solutions to statistical problems faced by any individual at any stage of his/her research project or thesis work; offering short statistical courses to improve statistical literacy and skills; and providing practical training to young statisticians to become excellent collaborators and to be effective statistical communicators.

Prior to the establishment of the interdisciplinary statistical lab students were exposed only to the theoretical aspects of statistical training with illustrations drawn mostly with data used in foreign textbooks. The students have always expressed concerns about the practicability and relevance of many of the courses and topics covered in their classes. The numerous university research community members have had to struggle to understand and use statistical tools needed for their research, sometimes leading to serious abuse of the procedures or drawing invalid and twisted inferences. UI-LISA has not only rejuvenated statistical collaboration in the premier university of Nigeria but has increased the enthusiasm of our statistical collaborators and student populace. It has also received the support of the university administration and other key academic units, centres and departments.

In this paper, we discuss three major programmes ingeniously designed and implemented since the establishment of UI-LISA in U.I and their impact on the student collaborators, the university community and the society. The rest of the paper is organized as follows: in section 2, we discuss UI-LISA outreach programmes designed to promote statistical collaboration in the university. In section 3, we discuss UI-LISA collaboration with a prominent Centre in the University. The impact of the UI-LISA programmes is given in section 4. Finally, section 5 discusses the challenges of UI-LISA and some concluding remarks.



## 2. UI-LISA Outreach Initiatives

The creation of UI-LISA provides a complementary support to the training of students to become interdisciplinary collaborators, provide infrastructure to enable and accelerate high impact research among staff and students, and engage with the community to improve statistical skills and literacy. In the rest of this section, three major outreach programmes developed to promote practical learning of statistics and sustain interdisciplinary collaboration are discussed.

**One hour (weekly) with a Statistician:** This is a homegrown statistical literacy program carefully blended with the cultural and religious sentiments of the people in the university community. It is a statistical advocacy platform which allows the users of statistical methods to learn more deeply about them and use them appropriately. The open forum holds for precisely an hour in the Department and it is facilitated by a UI-LISA collaborator. The platform provides an avenue for the community and even non-community members to engage statisticians on any statistical concept, methodology and procedures deemed not clear. In most cases, most community members particularly undergraduate and graduate researchers come to the lecture with their burning questions. The program usually holds between 3 – 4pm every Tuesday in the Department large lecture theater. After the one hour program, UI-LISA lab accepts clients for further consultations and practical demonstration on how to implement most ideas or methodologies delivered during the interactive session.

At the commencement of the programme, the facilitator introduces a popular concept and then engages the attendees about their knowledge and understanding of the topic. It is usually an interactive session beginning with establishing the level of understanding of the subject matter before moving to clarifications and explanations. Some of the topics covered during the previous editions include:

- Concept and Interpretation of p-value
- Exploratory Data Analysis
- Multivariate Methods in Statistics
- Sampling and sample size Determination
- Test of Hypothesis
- Regression Analysis: Strength and Abuse
- Statistical Inference: The Science of Decision Making
- Understanding Statistical Design and Analysis of Experiments

**Mobile Statistical Clinic:** As the name implies, it is an innovative approach through which statistical education is taken to the door-steps of the members of the university community. The UI-LISA team conducts its advocacy by moving outside the lab and stations at public locations such as halls of residence, conference areas, lecture theatres, parks, events centres and even recreational areas to provide on-the-spot solutions to problems and enquiries related to statistics. The mobile statistical clinic team consists of five members led by a trained graduate student who is undergoing a PhD program in statistics. In a situation where a client wants more statistical help beyond the field service, the team will refer the client to the UI-LISA lab for further assistance. The UI-LISA banner (see figure 1) is usually hoisted at the spot where the team is stationed and receiving clients. This program has been helpful in educating the university community members and visitors about the importance of statistics in day-to-day human activities.



Figure 1: UI-LISA Banner on Display During Mobile Statistical Clinic Session

**Collaborative Training Workshops:** The most important component of UI-LISA's outreach programmes is the collaborative training workshops. These workshops are organized in partnership with interested departments, centres, faculties, institutes and units in the university. It is usually demand-driven and focusing mainly on any aspect of statistical methodology peculiar to their discipline. Most often, it may target groups of researchers or postgraduate students or even faculty members working on specific problems. It may also be a special session devoted to statistical methodology during a conference, workshop etc. organized by the unit. In sum, it is a tailor-made arrangement to meet the statistical challenges of the partnering unit. For instance, the following collaborative trainings were organized:

1. UI-LISA and the Centre for Petroleum Energy Economics and Law (CPEEL) workshops for Faculty Staff and Students:
  - How to Conduct and Analyze Your Survey Data
  - Statistical Analysis with R Software
2. UI-LISA and the Faculty of Science workshop for Postgraduate Students
  - Basic Statistical Tools for Quality Research in Biological and Physical
3. UI-LISA and Faculty of Veterinary workshop for Postgraduate Students
  - Recent ASA's Statement on p-values
4. UI-LISA and Department of Crop Protection and Environmental Biology workshop for the National Agricultural Seed Council
  - Data Validation, Transformation and Analysis with R
5. UI-LISA and the Office of the International Programme (OIP) workshop for University of Ibadan Research Community
  - Promoting Openness, Integrity and Reproducibility of Scientific Research



### 3. UI-LISA Statistical Collaboration with CPEEL

The most successful statistical collaboration since inception of UI-LISA is with the Centre for Petroleum Energy Economics and Law (CPEEL). It is a multidisciplinary centre with experts coming from economics, engineering, law, finance, statistics and other disciplines. The relatively young CPEEL was established as a John D. and Catherine T. MacArthur Foundation funded Regional Centre of Excellence for training highly skilled personnel and conducting research on energy, including oil and gas, electricity, renewable, climate change, energy finance, regulations and energy contracts, rural energy and poverty, and appropriate energy technology. It is the first its kind in Africa (CPEEL (2016)).

The UI-LISA and CPEEL Collaboration has grown beyond providing training on statistical methods and use of statistical packages to developing an energy information system for the Centre. The partnership has been extended to initiating collaborative research in energy related issues. Energy is a major challenge in Nigeria and huge gap exists between demand and supply. The research collaboration is aimed at understanding the nature and scope of the energy problems by designing evidence-based studies that can lead to publication in high impact journals.

One of the products of this research collaboration is the ongoing study on the energy consumption pattern in a semi-urban settlement in the neighbourhood of the university. The objectives of the study are: to investigate the key determinants of energy consumption; to investigate the extent of the penetration of modern energy sources, such as inverters, solar panels, etc; to investigate the energy saving culture of the people; and to investigate the impact of the pre-paid and post-paid billing systems used by the electricity distribution company in the community.

The contributions of the UI-LISA to this study include: (i) designing of study; (ii) providing assistance in the demarcation of the study area into enumeration areas (EAs); (iii) providing training on the use of the mobile survey technology; (iv) participation of UI-LISA collaborators in the field administration; and (v) providing assistance in data collation, entry and analysis. Even though articles resulting from this study meant for publication are still being developed, the data generated have been found very reliable and are now made available for CPEEL students' project and published on the centre's website.

### 4. The Impact of UI-LISA in the University

Since the creation of UI-LISA, the lab has attended to over 200 clients seeking statistical help and services. Interestingly, they come from different faculties and departments within the university community and sometimes from outside as well. The lab has assisted 71 researchers to complete their studies. The clients cut across 8 faculties and one institute, namely, Agriculture, Technology, Science, Social Science, Education, Clinical Sciences, Pharmacy, Veterinary Medicine and Institute for Peace and Strategic Studies. Table 1 below shows the distribution of the clients by gender. Out of the 71 clients, 43 (61%) are male and 28 (39%) are female.

**Table 1: Distribution of Clients by Gender**

| Gender | Frequency (%) |
|--------|---------------|
| Male   | 43 (61)       |
| Female | 28 (39)       |

In Table 2, the distribution of the clients by academic program is shown. Altogether 29 Master Degree and 17 PhD students have been assisted in the project works.

A fascinating study presently receiving attention in the lab is a PhD research from the Department of Botany, Faculty of Science. The study is investigating the drought tolerance and nutrient use efficiency in white Yam (*D. rotundata* Poir). The lab is assisting in developing a screening protocol for nutrient





use efficiency (NUE) and drought tolerance in *Dioscorea rotundata*. Already, the design of the field experiment has been done and the client is now on the field-planting stage.

Table 2: Distribution of the Clients by Study Program

| Program/Position       | Frequency |
|------------------------|-----------|
| Diploma                | 1         |
| Higher Diploma (HND)   | 1         |
| B.Sc (Regular student) | 4         |
| B.Sc. (DLC)            | 4         |
| M.Sc.                  | 29        |
| MBA                    | 2         |
| PGD                    | 10        |
| PhD                    | 18        |
| Faculty Member         | 2         |

## 5. Conclusion

Despite the enthusiasm and interest that UI-LISA appear to have generated since its existence about two years ago, the lab still faces some challenges in its strive to improve statistical literacy in the university community. The most critical of these is the lack of funding support from the university management. Consequently, the imposition of moderate fee for service rendered to client is often unaffordable, thus preventing many potential beneficiaries from coming. Perhaps, the more disturbing challenge in research collaboration is the existing policy of the institution which tends to reward single authorship of scientific publication better than multiple authorship. This has been the most disincentive reason for partnership and collaboration. While we have enjoyed solid support and patronage from units such as CPEEL, Research Management Office (RMO) and Office of International Programmes (OIP) the same cannot be said of critical unit like the Postgraduate School.

The strategic vision of UI-LISA is to serve the premier university and be a place where every researcher must connect to be certified for quality and completion. We hope to be more relevant and prominent by serving as the major statistical consulting laboratory or body in the institution. To make this a reality, we intend to consolidate on our relationship with the Centre for Open Science (COS) by incorporating advocacy for openness, integrity, transparency and best practices in research workflow as part of our programme. Most importantly, we intend to remain a very strong member of the LISA 2020 Global Network. We hope to replicate this LISA template in other institutions around us and even beyond to achieve the target of creating 20 laboratories for interdisciplinary statistical analysis by the year 2020. Our goal is to remain steadfast, virile and be sustainable in striving to help solve societal problems, build the statistical skills of statistics students, and promote interdisciplinary research in the premier university.

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