STATISTICS EDUCATION, COLLABORATIVE RESEARCH, AND LISA 2020: A VIEW FROM NIGERIA

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Reforms in pedagogical techniques, collaborative research, and the improved use of information technology are strategies in teaching research-based statistics courses that have not yet been implemented in Nigeria. Based on results from empirical survey, we review the current level of awareness and challenges facing statistics education in Nigeria. One survey revealed that 69.4% of the respondents did not know statistics was a separate discipline from mathematics while 44.4% had never taken a statistics course. We discuss the challenges of collaborative research in Nigeria and introduce LISA 2020, a program to bridge the gap in statistics education between developed and developing countries by training statisticians from developing countries to become effective collaborative statisticians who can train other collaborative statisticians in the future.

INTRODUCTION

Statistics education can succinctly be described as the teaching and learning of statistics. It is an emerging field that is currently establishing itself as a unique field. In recent years, a large body of research has been dedicated to the teaching and learning of statistics as a subject (see for example, Cox (1997), Garfield and Ben-Zvi (2007), Agresti and Franklin (2009), Garfield and Burrill (1996). Rumsey (2002) opined that statistics is one of the most important quantitative subjects in a university curriculum and enumerated the basic meaning of statistical competence as follows:

- Data awareness
- An understanding of specific basic statistical concepts
- Knowledge of the basics of collecting data and generating descriptive statistics
- Basic analysis and interpretation skills-ability to describe statistical results in the context of the research problem
- Basic communication skills-being able to explain statistical results to someone else (especially a non-statistician).

All of these elements, including statistical collaboration and communication skills are taught to graduate students in Virginia Tech's Laboratory for Interdisciplinary Statistical Analysis (LISA). LISA's mission is to train statistics students to become interdisciplinary collaborators. See details in http://lisa.stat.vt.edu. In this paper, we present LISA 2020 as a vehicle for enhancing statistical competence and collaborative research in developing countries of the world but with particular reference to Nigeria.

OVERVIEW OF STATISTICS EDUCATION IN NIGERIA

Statistics education is unarguably in its infant stage in Nigeria. According to Lindsay, Kettenring and Siegmund (2004), the number of people with training in statistics is not growing fast enough to meet the high demands for statistical expertise in today's science, engineering, government laboratories and agencies. This situation is acute in Nigeria. Although, statistics education in Nigeria has improved considerably in the last few years, there is still a large gap in the statistics education obtained by students in Nigeria compared to that obtained in more developed countries of the world such as USA, Canada, UK and Germany. In a recent survey conducted by Adelodun and Awe (2013) about the knowledge and awareness of statistics education among undergraduate students in Obafemi Awolowo University, Ile-Ife, Nigeria, 69.4 % of the 216 students interviewed did not recognize statistics education as a separate field from mathematics or mathematics education.

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In the same study, a majority of the science and education students interviewed (44.4%) never took any statistics course(s) throughout their undergraduate degree. Of the students surveyed, 26.9% had taken only one statistics related course while only 3.2% of the respondents had taken more than three statistics or statistics related courses (see Table 1 below). These results illustrate the abysmally low statistical literacy level of students at one comprehensive university in Nigeria.

Table 1: Number of statistics courses taken by the respondents.

Statistics Courses	Frequency	Percent
None	96	44.4
One	58	26.9
Two	35	16.2
Three	20	9.3
More than Three	7	3.2
Total	216	100.0

In a recent survey by Awe and Oguntuase (2013) on the acquisition and utilization of statistical consulting and collaboration skills among 104 undergraduate students in Nigeria, 83.7% of the respondents interviewed had never been trained on any statistical software package. However, 78.8% of the respondents were willing to receive training on using statistical software if given the opportunity. Interestingly, 89.6% of the respondents desired to receive training on collaborative research skills.

While speaking during the celebration of the International Year of Statistics and the 40th anniversary of statistics at the University of Ibadan—Nigeria's premier university—the former acting head of the Department of Statistics at the University of Ibadan, Dr. Olanrewaju Shittu, called on the federal government of Nigeria to separate statistics from mathematics in the secondary school mathematics curriculum and to make it a standalone subject. He further explained that such a move would increase the appreciation and application of statistics in national development, claiming that this separate subject status is the only way students can appreciate statistics as a subject, manner, procedure and way of life so as to develop interest in it. (See more details in www.newsexpressngr.com › News › News).

Ogum (1998) summarized the problems confronting statistics education in Nigeria as follows:

- Reluctance on the part of the education authorities in Nigeria to recognize statistics as a distinct subject from mathematics.
- Insufficient number of qualified statistics teachers at all levels.
- Inadequate facilities in schools colleges and universities for teaching statistics.
- Lack of statistical awareness on the part of policymakers in the Nigeria.

Nigeria is a developing country and statistics education in Nigeria is also in its developing stage. As a matter of fact, there are still many in Nigeria who regard statistics as part of mathematics. Although, statistics and mathematics have some common features, there are several features unique to statistics. The improper perception of a subject can hinder its teaching (Moore, 1997). The role of statistical literacy in collaborative research has grown significantly over the years (Rumsey, 2002). This role arose because statistics can be applied in almost every field of human endeavor including medicine, agriculture, business, engineering, sports, biology, economics, and sociology. The application of statistics in research has grown from just analyzing data for percentages, means and standard deviation to applying more sophisticated techniques such as quality control, data mining, design of experiments, time series analysis, simulation techniques, Bayesian methods, etc. The use of statistics is actually indispensable in all educational and collaborative research (see Garfield and Ben-Zvi, 2007).

CHALLENGES OF COLLABORATIVE RESEARCH IN NIGERIA

Fishbough (1997) defined collaboration 'as a formal body established by two or more autonomous partners, none of whom is under contract to another but whose aim is to attain substantive or symbolic goals that no partner could achieve independently'. He referred to collaborative research as a term describing methodologies whereby students and/or researchers team up to actively engage in meaningful research for the benefit of the society. It is also a situation within which university researchers, community-based organizations, and policy makers work together in framing some research problems to be tackled, working together to undertake the research and interpreting the results and disseminating the research findings. In a collaborative research process, university researchers, community members, and policy makers respect the knowledge that each partner brings to the discussion so that together they might know better how to understand the complex problems facing our communities and how to design and implement research-based responses to those problems.

Despite the minimal research and innovative capability of the present set of universities in Nigeria, incessant strikes by faculty and staff have continued to jeopardize the research being undertaken by students and faculty. The kind of research and collaborative activities that can put Nigeria in the league of developed nations cannot take place in a disruptive environment such as the one currently being witnessed in Nigerian universities. The physical structure of many universities is substandard, books are either out of date or not available, the conduct of examinations does not meet the minimum requirements, and the standard of learning—especially of statistics—is quite low. It is clear that the recurrent strike actions by the Academic Staff Union of Universities (ASUU) has had negative effects on many ongoing research efforts by students and researchers as implied in a recent article on 'ASUU Strike: Beyond the 2009 Agreement' published on the 29th October, 2013 by the Nigerian Newspaper called Osun Defender. The article identifies students and lecturers at government-owned universities as the major victims of the fallout of the industrial actions. No concrete learning or collaborative research can take place in this environment.

LISA 2020: TOWARDS THE ENHANCEMENT OF STATISTICS EDUCATION AND COLLABORATIVE RESEARCH IN NIGERIA

LISA 2020 is a special project of LISA (Virginia Tech's Laboratory for Interdisciplinary Statistical Analysis) to educate and train statisticians and data scientists from developing countries to communicate and collaborate with non-statisticians and become collaborative statisticians. LISA's goal is to support these newly trained collaborative statisticians to create a statistical collaboration laboratory at their home university or institution and build a network of at least 20 statistical collaboration laboratories in developing countries by 2020.

At Virginia Tech and in LISA, statisticians from developing countries are being trained to become collaborative statisticians so that when they return to their home universities, they will create statistical collaboration laboratories to help researchers, government officials, and local industries and NGOs apply statistical thinking to make better decisions through data. The steps in the LISA 2020 plan are detailed in Vance (2013) and http://www.lisa.stat.vt.edu.

CONCLUSION

The main problems militating against an efficient statistical education program in Nigeria revolve around insufficient numbers of well-qualified statistics teachers at all levels, as well as inadequate facilities in schools, colleges and universities. Policies for improving statistical education in Nigeria must take into account the need to restore statistics as a school subject at the secondary school level. Statistics has been and will continue to be one of the most widely taught topics at the university level.

While statistics education has turned into a research area of increasing interest, implementing new instructional techniques and achieving an appropriate balance between theory and application is a challenging task in Nigeria. In this article we conducted a review of the level of statistics education in Nigeria. We outlined and identified problems and possible solutions in teaching statistics in Nigeria. We have also presented the novel vision of LISA 2020, which we hope will improve statistics education and collaborative research in Nigerian universities by

unlocking the research potential of many present and future researchers. In conclusion, we hereby make the following recommendations as a way forward:

1. Statistics education should be seen as an important discipline in Nigeria because its methods for collecting, analyzing, and modeling data can be applied to solve many real world problems.
2. Policymakers and educators in Nigeria should do all they can to improve statistics education in Nigeria, starting with:

   (a) Recognizing that statistics is a discipline separate from mathematics;
   (b) Providing research facilities for statisticians to collaborate with researchers in other fields;
   (c) Providing funding and training for statisticians to learn basic collaboration skills.

3. Statistics enables collaborative research. Therefore, policymakers and educators should establish statistical collaboration laboratories in every major university in Nigeria conducting scientific research.
4. Statisticians need to be educated and trained to become interdisciplinary collaborators because the most important problems are not statistical problems. Rather, the most important problems are real world problems in which statistics may be the key to discover the solution.
5. The LISA 2020 program should be embraced in Nigeria and elsewhere as an innovative program to educate and train statisticians and promote collaboration to solve real world problems.

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