

## ON THE COMMENCEMENT OF A CULTURE OF “STATISTICS ACCEPTANCE” IN A HIGHER EDUCATION INSTITUTION RELATIVELY NEW AT RESEARCH

Saleha Naghmi Habibullah

Kinnaird College For Women, Lahore, Pakistan  
salehahabibullah@gmail.com

*Notwithstanding the fact that Statistics has an important role to play in research, there exists an element of “fear and intimidation” among non-statisticians when they encounter the need to apply statistical methodology to research-related data. This paper presents an account of the ways in which the process of moving toward the development of a culture of “Statistics Acceptance” has been commenced at Kinnaird College For Women, Lahore, Pakistan --- a higher education institution acclaimed for imparting quality education to the young women which is relatively new at research. The initiatives described in this paper can be regarded as some of the earliest steps in the direction of research-enhancement through statistical education. The real challenge is to move forward in such a way that an increased awareness, acceptance and acquisition of ‘the statistical skill-set’ can not only be sustained but also enhanced over time.*

### INTRODUCTION

It is well-established that Statistics has an important role to play in research. Utts (1999) remarks: “Statistical methods are designed to detect and measure relationships and effects in situations where results cannot be identically replicated because of natural variability in the measurements of interest. They are generally used as an intermediate step between anecdotal evidence and the determination of causal explanations.” And, in the epilogue of his book, Huck (2012) proposes:

When you encounter people who promote their points of view by alluding to research, ... pose a few *exceedingly legitimate* questions:

- If the research data were collected via mailed questionnaires, what was the *response rate*?
- No matter how the data were collected, did the researchers present evidence as to the *reliability* and *validity* of the data they analyzed?
- Did they attend to the important *assumptions* associated with the statistical techniques they used?
- If they tested *null hypotheses*, did they acknowledge the possibility of *inferential error* when they rejected or failed to reject any given  $H_0$ ?
- If their data analysis produced one or more results that were significant, did they distinguish between *statistical* and *practical significance*?

At the same time, it is important to realize that there exists an element of “fear and intimidation” among non-statisticians when it comes to the utilization of statistical methodology in research. Commenting on the role of beliefs and attitudes in learning statistics in the classroom, Gal and Ginsburg (1994) note the following:

While many teachers of statistics are likely to focus on transmitting knowledge, many students are likely to have *trouble* with statistics due to non-cognitive factors, such as *negative attitudes or beliefs towards statistics*. Such factors can *impede* learning of statistics, or hinder the extent to which students will develop *useful statistical intuitions* and apply what they have learned outside the classroom.

Focusing on the process of writing a Research Proposal, Onwuegbuzie (1997) presents the results of a study that examines the *anxiety* experienced by a sample of 81 graduate students from non-statistical disciplines, who wrote research proposals in an introductory research methodology course. The author identifies four components of proposal-writing anxiety (RPW) i.e. (a) library anxiety, (b) statistics anxiety, (c) composition anxiety and (d) research process anxiety, and goes on to say that Statistics Anxiety consists of (i) Perceived Usefulness of Statistics, (ii) Fear of Statistical Language, (iii) Fear of Application of Statistics Knowledge, and (iv) Interpersonal Anxiety.

The important question is: how to develop in an educational institution a culture of “Statistics Acceptance” so that non-statisticians are able to (i) break the barriers of Statistics *anxiety* and (ii) develop in their minds a *willingness* to learn the fundamentals of statistical reasoning and methodology. The following sections of this paper presents an account of the ways in which the process of moving toward “Statistics Acceptance” has been commenced at Kinnaird College For Women, Lahore, Pakistan—a higher education institution acclaimed for imparting quality education to the young women for the past one hundred years which is relatively new at research.

#### A BRIEF HISTORICAL OVERVIEW

In this section, we present a brief account of initiatives undertaken by the Kinnaird College Statistics Department for the enhancement of statistics education during the period 1985-2010:

- In the summer of 1985, a statistical survey was initiated by the students of the BA/BSc Statistics class under the supervision and guidance of their teacher—an exercise involving the practical application of statistical methodology—something similar to which had never been undertaken at Kinnaird before (Habibullah,1990).
- The six-month-long endeavor undertaken by the final year students of 1985-86 turned out to be the harbinger of a *series* of projects and programs for the enhancement of statistical education in Pakistan. These included statistical research projects, exhibitions and competitions for enhancing the data – analytical skills of students at the undergraduate and intermediate levels of education (Habibullah, 1991; 1992).
- In 1992, a series of workshops was initiated at Kinnaird by the name of “Statistics Teachers Educational Program (STEP)” (Habibullah, 1995). As many as ten STEPs were accomplished in a span of four years from 1992 to 1996.
- In 1997, the workshop series was renamed to be called the “Kinnaird College Statistics FESTIVAL” i.e. “Forum for the Enlightenment of Students, Teachers, Innovators, Veterans, Amateurs and Learners” (Habibullah, 1999).
- In the summer of 2004, the College was successful in achieving for its Statistics students the organization of the first-ever Internship Program conducted by the Statistics Division, Government of Pakistan (Habibullah, 2006).
- In 2005, Kinnaird witnessed the launch of the “Statistical Consultancy Training Program”—an endeavor to expose the MSc Statistics students to the process of statistical consultancy—an initiative something similar to which had not been attempted before in the country (Habibullah, 2007).
- In the Spring of 2010, a Two-Day Workshop on “Statistical Analysis Through Computers” was organized at the College for faculty-members and students of Statistics belonging to different cities and towns of Pakistan.
- The Kinnaird College Statistics FESTIVAL was organized on October 18, 2010, Kinnaird College thus becoming the *first* educational institution in the world to have celebrated the *World Statistics Day*. In his email, Chief, Statistical Services Branch, UN Statistics Division wrote: “We would like to thank you for this initiative and for your contribution of making World Statistics Day a success - *far beyond the community of official statisticians.*”

#### KINNAIRD’S PROGRESS TOWARD THE DEVELOPMENT OF A RESEARCH-CULTURE AT THE COLLEGE

Kinnaird College For Women was granted academic autonomy in autumn 2002 subsequent to which the four-year-long BA/BSc programs were launched at the College in September 2003, and conduct of a six-credit-hour research project was regarded as one of the mandatory requirements of the Bachelors degree. Ever since, every one of the 350 or so students of the graduating class of BA/BSc every year is required to carry out a small-scale research project under the guidance of her supervisor, and to defend her work in front of a panel of faculty-members. In addition to a variety of Bachelors programs, the College is now offering MPhil Programs in a number of disciplines, research being an integral part of each of these Programs.

The fall semester of the academic year 2011-12 witnessed the creation of the Kinnaird Multidisciplinary Research Group (KMRG) at the College ---- a group of faculty-members who expressed interest in engaging in research over and above research-supervision of BA/BSc/MPhil students. Soon after its creation, the Group became involved in a number of activities including brainstorming sessions, meeting with eminent researchers, participation in research-related workshops presentation of research papers in conferences, and the like. In addition, concrete efforts were made for (i) the commencement of research-projects to be undertaken by Kinnaird faculty in *collaboration* with other institutions and (ii) preparation of research-proposals to be sent to *funding agencies* such as the Higher Education Commission of Pakistan.

A number of workshops were organized at Kinnaird during the years 2012 and 2013 for purposes of capacity-building vis a vis research, and, of these, the workshops rendered by two professors from North America (one from Canada and the other from USA) that were organized at the College during the months of March and September 2012 respectively carry special significance. The four workshops rendered by Dr. Kevin J. Keen, Associate Professor, University of Northern British Columbia (Canada) in March 2012 were entitled “Introduction to LaTeX”, “Some Tips for Good Research”, “Time Management” and “Good Graphics with R”. The five-day-long Workshop by Dr. Marina Meila, Associate Professor, University of Washington (USA) was entitled “How to Develop a Research Culture in a Higher Education Institution of a Developing Country”.

As far as participation in conferences is concerned, although a few of the faculty-members had been interested and actively engaged in conferences for the past many years, until the summer of 2012, there did not exist at Kinnaird a “Conference Culture” in the *true* sense of the word. In June 2012, BA/BSc students of the graduating class were invited to attend tutorials on “how to convert research reports to conference papers” rendered by the author. The tutorials served the purpose and resulted in *twenty papers* being presented by Kinnaird students at a conference in Lahore in July 2012 and *nine* at a conference in Peshawar the following September.

The Kinnaird Multidisciplinary Research Conference (KMRC, 2013) was organized at the College on November 18-19, 2013—the first of its kind at Kinnaird. Along with a fairly large number of participants and invited speakers from within the country, the conference attracted seasoned professors who were requested to participate as invited speakers and traveled all the way from three technologically advanced countries of the world.

It appears that, with (i) a fairly large number of faculty-members currently enrolled in PhD programs, (ii) the launch of not only more Bachelor and MPhil programs but also PhD programs (which are in the pipeline), (iii) organization of research-related workshops and conferences, and (iv) the launch of one or more research-related journals in the near future, the administration, faculty, students are steadily moving toward the development of a research culture at Kinnaird.

#### EFFORTS FOR PROMOTING THE USE OF STATISTICS IN RESEARCH

Although statistical analyses are a necessary requirement for a majority of the research projects undertaken by the BA/BSc and MPhil students at Kinnaird, it has been noticed repeatedly that, in the case of a majority of disciplines (other than Statistics), understanding of statistical concepts is relatively weak, and that a sizeable proportion of the students resort to elementary univariate analyses such as computation of percentages and/or mean values. A situation not too different from the one described above seems to prevail at the MPhil level. In the following subsections, we present some examples that demonstrate the ways in which efforts are being made at the College for creating awareness among the faculty-members and students regarding the usefulness of statistical methodology in accomplishing good quality research.

##### *Ninth International Conference on Statistical Sciences*

As indicated above, on the initiative of the author, a team of about twenty faculty-members and students participated in the Ninth International Conference on Statistical Sciences in Lahore on July 5-6, 2012 where as many as *twenty* papers were presented by students of Kinnaird College. By motivating students from a variety of disciplines including Geography, Economics and Zoology to present papers at a Statistics conference, the message regarding the *all-inclusive* applicability of Statistics was conveyed to the faculty and students in a soft and subtle manner.

### *Workshop On Good Graphics With R*

Having met Dr. Kevin J. Keen, Associate Professor, University of Northern British Columbia (Canada) at the Eighth International Conference On Teaching Statistics (Slovenia, July 2010) and having learnt about his recently published book “Graphics for Statistics and Data Analysis with R” (Keen, 2010), the author invited him to travel to Lahore, Pakistan in order to render a workshop to the Kinnaird faculty on the subject. Having arrived at Kinnaird College on the 14<sup>th</sup> of March 2012 for a two-and-a-half-week-long visit, among other things, Dr. Keen delivered a five-day-long Workshop on Good Graphics with R and presented a *large number* of conceptual and methodological points related to effective graphical communication of facts and figures using R. *Hands-on training* provided the fifty or so participants their very first exposure to R, and the variety of examples provided by Dr. Keen demonstrated very effectively the “*multidisciplinary applicability*” of graphs, charts and diagrams. Feedback from faculty testifies to the fact that this workshop played an important role not only in bringing everyone *together* in a very pleasant mode but also in inculcating in people’s minds the idea that Statistics is applicable *everywhere* and that some amount of “statistical know-how” is bound to be useful.

### FUTURE DIRECTIONS

Upon being asked about the *role* of Statistics in research, two faculty-members of Kinnaird College, one from the Department of Computer Science and the other from the Departments of Accounting and Finance, offered *highly positive* remarks. Their statements are reproduced below:

- “Being a researcher in the field of computer science, application of statistical concepts comes naturally to us. It is within every data set that we have to do sampling since the population sizes are much greater. Then comes the factor of probability. Since computer science is an application-oriented domain modeling every other field possible, giving solution to real-world problems; probability is much needed to make sense of the non-determinism and stochastic nature of the world as it exists.”
- “No research can be effective if it is based on hit and trial or hunches or gut feeling or emotions or intuitions. Our daily routines are surrounded by forecasts and incremental and drastic changes taking place in business and economics usually depend on the better audit of the planned or future actions. Thus, informed use of statistics is of direct importance to analyze the decisions to make the actions more believable and competitive.....Statistics is the lifeblood of any research as it plays the role of middleman between the research design and methodology. One cannot prove the authenticity of proposed phenomena unless and until data is being quantified into objective manner and this objectivity lies in the function of using various statistical methods and analyses so that research findings can be better communicated. ...Statistics increases the worth of our work by checking the validity of instrument, reliability of data, efficiency of results and playing with the numerals in a variety of ways by applying flexibility. Moreover, while finding results, we sometimes come across totally new avenues of research findings which otherwise we would not have known about and the credit of these new horizons goes to statistics.”

It appears that not *every* non-statistics faculty-member is ignorant/unaware about the important role of statistics in research. On the contrary, there seem to exist *three categories* of faculty-members belonging to disciplines other than Statistics:

- (i) those who have only meager knowledge of Statistics and its importance,
- (ii) those who have a moderate amount of knowledge and/or awareness, and
- (iii) those who are *well-versed* regarding the role of Statistics in research (such as the two mentioned above).

By virtue of the existence of the third category, there seems to be considerable scope for elevating the *overall* level of awareness and understanding of Statistics in the College. One idea that comes to mind is the constitution of a “*Statistics Promotional Group*” spearheaded by *non-Statistics* faculty-members who are comfortable and/or well-versed in Statistics.

## CONCLUDING REMARKS

In this paper we have presented an account of the ways in which the process of overcoming “Statistics Anxiety” and moving toward “Statistics Acceptance” has been commenced at Kinnaird College For Women, Lahore, Pakistan—a higher education institution acclaimed for imparting quality education to the young women for the past one hundred years which is relatively new at research. In her capacity as Director Research (ever since November 2011) in conjunction with the position of Associate Professor, Statistics, the various initiatives taken by the author contribute toward the dissemination of the idea—in a soft and subtle manner—that Statistics is applicable *everywhere*, and that some knowledge of Statistics is *vital* for making headway in any research that is based on systematic empirical investigation. Given the issues of non-interest and limited knowledge of Statistics coupled with social processes that affect the place of Statistics in the academic systems of Pakistan, these initiatives can be regarded as some of the earliest steps in the direction of research-enhancement through statistics education *across-the-board*.

Two years or so being too short a span of time for bringing about a significant change in the “socio-academic” culture of a hundred-year-old institution, the series of endeavors initiated in November 2011 is in a stage of infancy. Given that (i) research is an integral part of the BA/BSc, MS and MPhil Programs offered by the College and (ii) the College is aspiring to upgrade a number of MS/MPhil Programs to PhD Programs during the next few years, the importance of the *continuation* of this initiative cannot be over-emphasized. Feedback from faculty indicates that the message has started getting across—even among *those* faculty-members who were previously *alien/diagonally opposed* to the idea of using Statistics in their teaching and research. Consistent effort in this regard is bound to result in *capacity-building* and/or *an improved understanding* of the importance of Statistics in research among the Kinnaird faculty and students.

The process of using Statistics for driving change has begun. The real challenge would be to move forward in such a way that the increased awareness, acceptance and acquisition of ‘*the statistical skill-set*’ for purposes of high-quality research can not only be sustained but also enhanced over time.

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