STATISTICAL CONSULTANCY IN A SOUTH AFRICAN UNIVERSITY: USING A RESEARCH RESOURCE CENTRE TO EMPOWER SOCIAL SCIENCE RESEARCHERS ®

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A major objective of the University of Transkei Research Resource Centre is to enable staff and students to acquire research knowledge and skills. This is intended to empower faculty to initiate quality research projects and participate effectively in ongoing research. We recognised that research skills of staff and students ranged from none to well-experienced. In addressing different needs we found that an effective method was to relate all activities to the context of the research and where possible to specific research projects. Importantly we endeavoured to anticipate needs and afforded researchers with face-to-face sessions, a number of workshops, short courses and research seminars. This paper discusses how the consultancy process is used to empower social science researchers.

INTRODUCTION

The Research Resource Centre at the University of Transkei is currently one of only two in South Africa. It was established in 1997 through funding from the Division of Social Sciences and Humanities within the National Research Foundation. The Centre provides and facilitates on-going research training and related support to academic staff and postgraduate students. It also provides a forum for interaction between the statistician and a researcher and is therefore a fertile ground for learning on both sides (Belli, 2001).

FUNCTIONS OF THE RESEACH RESOUCE CENTRE

The University of Transkei, an institution of higher learning in a rural, underdeveloped, and impoverished area, has its major focus on empowering people to meet the needs of a society in transition. Its policies and programs are directed primarily towards redressing imbalances of the past while at the same time striving to meet present and future challenges. The functions of the Research Resource Centre should of necessity be viewed within the context of this University.

The objective of the Centre is to enable faculty, staff and students to acquire research knowledge and skills so that they will be able to initiate quality research projects and participate effectively in ongoing research. The Centre strives to facilitate research capacity development and research excellence within the university. In research capacity building, the aim is to develop appropriate research skills at an individual level and promoting a culture of research at institutional level. Hopefully these will ultimately lead to a nucleus of individuals showing research excellence that could be beneficial nationally. The primary functions of the Centre are:

- Providing assistance with project planning and writing of research proposals;
- Providing a statistical advisory service to facilitate data acquisition, capture and analysis within research projects;
- To provide information to researchers on research and research policy at other institutions and government agencies;
- To organize seminars, workshops and short courses related to all aspects of the research process;
- To provide physical resources in the form of computers and statistical software for the production of reports and other academic outputs, e.g., conference posters/papers and refereed journal articles;
- To promote the use of Information Technology in the human and social sciences and so assist in the creation of a significant mass of networked information that can enrich a sense of community, foster intellectual collaboration, preserve cultural information and ultimately improve the quality of teaching and learning within the University;
- To become a centre of expertise and excellence in quantitative and qualitative data

analysis methods and relevant computer packages; and
- To produce a number of research reference guides covering all aspects of the research process.

STATISTICAL EDUCATION OF SOCIAL SCIENCE RESEACHERS

Academic staff and the postgraduate students who use the Research Resource Centre have a wide range of backgrounds (from Anthropology to Zoology). Their research skills vary from none (beginners) to well-experienced. There is also an uneven level of statistical knowledge. At certain times one sees staff or students with no statistical or mathematical background at all. At other times staff or students with a range of knowledge (frequencies, percentages to multivariate analysis) visit the Centre. To address the different needs of researchers we found that an effective method was to relate all activities to the context of research and wherever possible to a specific research project. Such an approach entails using real rather than "fake" data and this has been supported by a number of statistics educators. Hirotsu (2001) for example, argues that it is essential to use actual problems to teach statistics, while Ospina and Ortiz (2001) support the use of real data to solve real problems. Svensson (2001) also, encourages the use of the researcher's own research problems as a way of understanding methodological and statistical theories. In adopting this approach, this has enabled us to stress the conceptual understanding of statistical ideas. Also, it has helped to ensure the appropriate application of a technique and emphasise correct interpretation of results.

HOW THE CONSULTANCY PROCESS WORKS

Face To Face Sessions

Serious problems for research students have been reported to revolve around inadequate training in study design principles and statistical methodology, both essential for planning research and analysing data (Harraway, Manly, Sutherland, & McRae, 2001). In order to overcome these problems, we decided on using face-to-face sessions in which the researcher explains his/her work. In most cases the researcher brings data and will ask that it be analyzed. Most researchers will utter statements like "…could you please use statistics to analyze this data for me…". Naturally we ask questions such as: What do you plan to do with the data? What questions will be answered by the study? How will the findings be reported? and so on. From such an interview we get a sense of what the researcher's intentions are, and offer suggestions as we see fit. Through repeated questioning and search for a solution the process continues until satisfactory results for both the consultants and the researchers are achieved.

At all times we ensure that ours is a role of a facilitator and avoid taking over. We make sure that the researcher searchers for answers, provides alternative suggestions on how else a particular problem could be solved and so on. This ensures that at the end, the researcher who approached us with a particular problem leaves with not only the problem solved but with a better understanding of the statistical approaches they have used. Naturally, researchers will have a sense of accomplishment from having participated in a problem solving exercise they initially thought was beyond them. This, we hope is reciprocated when our consulting staff and students teach others.

The face-to-face sessions have given us an indication of statistical methods used by researchers who have consulted us. Table 1 shows a range of statistical methods used by consulting staff and students over a period of two years. This range of statistical methods used has provided us with sufficient information of what we can expect to be asked and what we can prepare for seminars, workshops and short courses.

Table 1
Statistical Method Frequently Used

Method	N	%
Frequencies and Percentages	40	21
Mean, Mode, Median	48	25
t-test	10	5
Analysis of variance ANOVA including post hoc tests	15	8
Correlation (Pearson, Split half)	8	5
Simple regression	15	8
Multiple regression	7	4
Reliability analysis (using Cronbach α)	23	12
Chi-square	18	9
Principal components analysis	5	3

WORKSHOPS

Another method we have used is organizing workshops in which staff and students were invited to attend. We decided on this because we realised that we could reach many more people this way. Also, this method enabled individuals to talk about their problems and could therefore arrange appointments for face-to-face sessions. The workshops took place every second week of the month. Workshop activities have been used: (a) to introduce beginning social science researchers to the theoretical and practical perspectives of research, (b) to develop understanding of quantitative statistical techniques and the associated computer packages used in data analysis and (c) to develop writing skills and promote publication of research activities.

We found the cyclic approach to research articulated by Bishop and Talbot (2001) an extremely useful guide for structuring and planning what was to be done in each workshop. They call the elements of this cycle, Problem, Plan, Do, Study, Act (PPDSA) where five stages of an investigation are described as:

- Problem: Obtain a clear conception of learning goals;
- Plan: plan the procedures to carry out a study;
- Do: Collect the data according to the plan;
- Study: Analyze and interpret the data;
- Act: Modify one's view of the problem in the light of the data.

The PPDSA is useful in guiding novice researchers through the research process. Conventional forms of statistical analysis that we stress are summarised in Table 2. In descriptive statistics participants are shown how they can use this to describe basic features of their data; provide simple summaries about their samples; and create visual summaries (tables and graphs). We stress this because descriptive statistics form the basis of virtually every quantitative analysis of data where the researcher describes "…what is, what the data shows" (Trochim, 1999, p.250).

A major part of social research is qualitative in nature and may involve interviews, for example. Our objective is always to highlight differences in the approaches of quantitative and qualitative analyses. We do this by showing, for example, that in quantitative analysis a researcher carries out data analysis by examining individual elements, "first in isolation (univariate statistics) and then in various combinations with other elements (bivariate and multivariate statistics)" (Mouton, 1996, p.169). An important aspect stressed is that the researcher should determine whether results obtained from a sample may be generalised to the population or not; which naturally leads to the use of inferential statistics to estimate population parameters or test hypotheses. In qualitative analysis researchers are shown how "the investigator usually works with a wealth of rich descriptive data collected through methods such as participant observation, in-depth interviewing and document analysis that are more holistic, synthetic, and interpretive" (Mouton, 1996, p.169).

Table 2
Forms of Statistical Analysis

Descriptive Statistical Analysis	This is used to enable the researcher to organise and summarise the data, to render the results more comprehensible
Inferential Statistical Analysis	This is used to enable the researcher to establish whether the observed results represent true population values. It is used: 1. To estimate population parameters 2. For hypothesis testing, e.g., chi-square, t-tests, ANOVA
Univariate Analysis	Used to identify properties of single variables Nominal/ordinal data, e.g., gender, class Examples: percentages, mode, median, range Interval data, e.g., age, income, test score Examples: mean, standard deviation
Bivariate Analysis	Used to identify relationships between two variables Nominal/ordinal data, e.g., gender, class Examples: Spearman's rank correlation Interval data, e.g., age, income, test score Examples: Pearson product-moment correlation, regression
Multivariate Analysis	Used to identify relationships among several variables Nominal/ordinal data, e.g., gender, class Examples: Correspondence analysis Interval data, e.g., age, income, test score Examples: principal component analysis, Multiple regression

A few examples of typical workshop activities will illustrate how the process is undertaken. The initial workshops were primarily on preliminaries to the research process. A number of follow-up workshops were intended to introduce participants to SPSS, but also served to help them develop a conceptual understanding of basic statistical ideas, learn how to use statistical techniques correctly and to interpret the resulting output sensibly. In a workshop on proposal writing for example, participants were taken through the five PPDSA stages. They were shown, for example, that in order to be committed to a specific research focus and to provide some indication of how their research will be undertaken, it is important that on those early visits to their supervisor they should be able to:

- Explain briefly the topic they would like to research
- Indicate why they selected that particular topic
- Show how they intend to go about researching the topic

In another typical series of workshops, participants had to access SPSS and navigated through several layers of windows. This of course gives participants a feel of how this package operates. They were then introduced to the idea of creating a codebook and the related data file. We did this by providing participants with an extract from a survey questionnaire we were working on. Following an interactive question-and-answer session, participants started creating their own copies of the codebook. They were then introduced to the procedure for creating a data file and using the codebook to enter data from the questionnaires. After data capture participants were then introduced to the need to check and clean their data set, which naturally leads into data analysis. At this stage participants were tasked to follow the procedures they had learned using their own data, (at all times they could consult on any problems they experienced). Depending on

individual projects, ideas were introduced on the use of frequencies, cross-tabulations, tables, graphs, descriptive statistics and correlation, etc. As much as possible we avoided simply telling participants what to do, relying instead on asking questions about data and obtaining ideas about what could be done. This way, participants were led to suggest appropriate routes for analysing their own data and simultaneously we were able to introduce the relevant statistical ideas within the context of their specific data sets.

Through workshops and short courses we have been able to address the following topics:

- Proposal writing;
- Design of research instruments;
- Literature searching and database access;
- Creating a codebook;
- Use of SPSS for data analysis;
- Basic quantitative data analysis (frequencies, tables, means, correlation);
- Visualising empirical relationships (scatter plots, simple and multiple regression);
- Use of data archives;
- Secondary data analysis;
- Basic and advanced project design;
- Report writing;
- Writing for publication.

As our approach is one that encourages and promotes experiential, hands-on, active participation, an unexpected problem has been the lack of computer literacy among staff and students alike. While in practical terms this has taken a lot of time, fortunately, participants have responded positively and progress has been good once initial handicaps were overcome. A more serious difficulty has been a general lack of familiarity with and formal knowledge of basic statistical ideas. As background level in this area ranged from nil to one or two with experience of multivariate techniques, we found that introducing ideas within the context of a particular project and its data set has been beneficial and less threatening to participants.

SUMMARY

In this paper, we have provided a view of how a Research Resource Centre, in a university was used as a 'statistical consultancy agency' to empower social science researchers. In doing this we have attempted to provide a contextual perspective of our Centre, which is vital in facilitating research capacity among researchers in the University of Transkei. In the Centre we have responded to people's needs as and when they arose. More importantly, we have endeavoured to anticipate the needs and afforded researchers with face-to-face sessions, a range of workshops, short courses and research seminars. We have viewed this as consistent with Belli's (2001) suggestion that consultancy skills should be an important aspect of statistical training.

We have found that our consulting approach works. This we base on report backs participants have given us about dissertations submitted for higher degree qualification and publications in peer-reviewed journals. Clearly, the work we do requires that both participants and consultants should work harmoniously, an issue Godino, Batanero and Jaimez (2001) also stress. About this they point out that "consultants need the client's contribution, as much as clients need consultant's knowledge, and both of them require some adequate structure supporting this work (material resources, knowledge, attitudes, etc.)" (p. 347).

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