MICHAEL GLENCROSS AND ANDILE MJI

THE ROLE OF A RESEARCH RESOURCE CENTRE IN THE TRAINING OF SOCIAL SCIENCE RESEARCHERS

At the University of Transkei teaching and research are considered to be two sides of the same coin. Research is thus regarded as a fundamental and indispensable activity. With the University facing the challenge of becoming competitive within the new structure of higher education in South Africa, a strategic plan for research in the Humanities and Social Sciences has resulted in a flexible blueprint for research development. The Research Resource Centre supports this initiative by facilitating research capacity development and research excellence within the University. This paper discusses the role of the Research Resource Centre in the provision of research training for social science researchers and provides details of the various workshops and seminars used to develop skills in the use of statistics and computer-based statistical packages.

1. BACKGROUND

As in most universities, teaching and research at the University of Transkei are considered to be two sides of the same coin. Research is thus regarded as a fundamental and indispensable activity. With the University facing the challenge of becoming competitive within the new structure of higher education in South Africa, a comprehensive research planning exercise was undertaken in 1998 that involved the Faculties of Arts, Economic Sciences, Education, Law, Health Sciences, and Science. The objective was to develop a co-ordinated suite of strategic research plans that would form the basis for research activities in the short and medium term and provide a framework for assessing external funding from a variety of sources. The completion of the Strategic Plan for Humanities and Social Sciences for the period 1999-2001 (Dye, Glencross, Mijere, & Ntusi, 1998) has resulted in a flexible blueprint for research development that will take the University well into the new millennium.

The Research Resource Centre at the University was established in December 1997 with the aid of funding from the then Centre for Science Development, now the Division of Social Sciences and Humanities within the National Research Foundation. This followed the successful establishment of another Centre, the Govan Mbeki Research Resource Centre, at the University of Fort Hare. The Research Resource Centre provides and facilitates regular on-going research training and other related support to academic staff and postgraduate students. Links between these two Centres are maintained by email and telephone, information about seminars is shared, although no between-Centre visits have taken place yet. The National Research Foundation has also attempted to set up a third Research Resource Centre at the University of Zululand, but staffing and infra-structural difficulties have so far prevented this.

2. FUNCTIONS OF THE RESEARCH RESOURCE CENTRE

The functions of the Research Resource Centre must, of necessity, be viewed within the context of the University as a whole. The University of Transkei, as an institution of higher learning in a rural underdeveloped area of South Africa, has its major focus on empowering people to meet the needs of a society in transition. Thus, its policies and programmes are directed primarily towards redressing imbalances of the past while concurrently striving to meet challenges of the present and the future. The University,

"perceives itself as part of a family of African institutions of higher learning firmly committed to the scientific, technological, cultural and human advancement of the African continent and to that of the international community" (University of Transkei, 1999, p.1).

The mission of the Centre is to facilitate research capacity development and research excellence within the University. Research capacity development is first and foremost about developing appropriate research skills at an individual level and promoting a culture of research at the institutional level which together lead ultimately to research excellence nationally. Broadly speaking, the major objectives of the Centre are consistent with those of the University, namely, to enable academic staff and students to acquire research knowledge and skills so that they are able to initiate quality research projects and participate effectively in ongoing research. Although the primary focus is on research in the human and social sciences, the Centre embraces the full range of disciplines within the University. The primary functions of the Centre are as follows:

- To provide assistance with project planning and writing of research proposals;
- To provide 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 organise 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, conference papers and refereed journal articles.

In addition to these functions, the Centre strives:

- 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;
- To provide a link between the South African Data Archives and individual researchers;
- To provide a regular newsletter;
- To produce a number of research reference guides covering all aspects of the research process;

- To provide links with other research institutions and Internet sites through its own Internet web site (http://www.utr.ac.za/rrc/).

3. AN APPROACH TO THE TRAINING OF SOCIAL SCIENCE RESEARCHERS

Our approach to the training of social science researchers has involved a structured view of social research (Mouton, 1996) and has featured the use of workshops and short courses, supplemented by a variety of research seminars. At all times, the focus has been on the complete process of research as a coherent, integrated activity that involves the stages described below (Mouton, 1996).

Formulating a research problem
Two key tasks are involved. First, the 'what' of the research study, that is, the unit of analysis must be specified and second, the 'why' of the study, that is, the research objectives or purposes must be made clear. The unit of analysis, or 'case', requires the researcher to be clear about what kind of social entity is to be studied, what the variables are and what relationships may exist between them. The research objectives may be identified from a combination of the existing background knowledge and the interests, motives and preferences of the individual researcher.

Research design
It is a *sine qua non* that a well-defined research problem is needed for any research investigation. The all-important research design, which is basically a set of guidelines for addressing the research problem, follows logically from the research problem and enables the researcher to anticipate later research decisions and maximise the validity of the final results.

Conceptualisation
Conceptualisation is seen as the process of defining the key concepts in the statement of the problem. Since it is essential for the researcher to relate his/her work to an existing body of theoretical and empirical knowledge, conceptualisation also involves integrating the research study into a larger conceptual framework.

Operationalisation
This consists of providing links between the key concepts in the statement of the problem and the actual phenomena to be studied. Invariably this involves the construction of a measuring instrument such as a questionnaire, test or observational schedule, whose items serve to operationally define the variables in the study.

Sampling
The idea of sampling is familiar to most people. In social research, sampling means some form of random selection of elements from a target population to produce a representative selection of population elements.

Data collection
In social research the fact that human beings are the focus of inquiry and usually react to being studied and investigated, creates unique problems that are not experienced in the physical sciences. This reactivity is affected by both the kind of data source and

the control measures used by the researcher. In addition, errors associated with data collection arise from effects related to the researcher him/herself, context effects and effects originating in the research setting.

Controlling for all of these effects is practically impossible, but has given rise to a number of methods, such as triangulation, anonymity, confidentiality, experimental and control groups, that help to minimise threats to reliability and validity.

Data analysis and interpretation

The analysis of social research data involves firstly, the reduction of the wealth of data collected to manageable proportions, and secondly, the identification of patterns and themes in the data. This often involves a combination of both quantitative and qualitative data analysis.

Writing the research report

Like the research study itself, the research report is a function of a variety of factors: the purpose of the research, the interests of the researcher and the assorted practical constraints of resources. The research report thus represents a reconstruction of the research process and is written in the form of a logical and persuasive argument. There are clear differences between a master's dissertation, a doctoral thesis and a journal article for publication.

The workshop activities have been used: (1) to introduce beginning social science researchers to the theoretical and practical perspectives of research, (2) to develop understanding of quantitative statistical techniques and the associated computer packages used in data analysis; and (3) to develop writing skills and promote the publication of research activities. For example, the following topics have all been addressed in workshops and short courses over the past two years:

- Basic and advanced project design;
- Design of research instruments;
- Literature searching and data base access;
- Use of data archives;
- Secondary data analysis;
- Programme evaluation;
- Supervising research projects;
- Basic quantitative data analysis (frequencies, tables, means, correlation);
- Advanced quantitative data analysis (ANOVA, principal component analysis);
- Creating a codebook:
- Visualising empirical relationships (scatter plots, simple and multiple regression, correspondence analysis);
- Use of SPSS for data analysis:
- Proposal writing;
- Report writing;
- Writing for publication.

4. TOWARDS THE STATISTICAL EDUCATION OF SOCIAL SCIENCE RESEARCHERS

Collectively, the academic staff and postgraduate students who make use of the Research Resource Centre's facilities have a wide range of backgrounds (from anthropology to zoology and including education, nursing science, psychology and sociology), varied research skills (from beginners to well-experienced) and an uneven level of statistical knowledge (from frequencies and percentages to multivariate analysis). In addressing the statistical education needs of social science researchers, we have found it effective to relate all activities to the context of research and, wherever possible, to a specific research project. This inevitably involves using real rather than 'fake' data, an approach supported by a number of other statistics educators. For example, Hirotsu (2001), 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 as in the long run, this is important for statistics education. Similarly, Svensson (2001) encourages the use of the researchers' own research problems as a way of understanding methodological and statistical theories and has adopted an approach that focuses on statistical strategy rather than statistical technique. Such an approach puts statistics in context and serves to motivate researchers. In this way we are able to stress the conceptual understanding of statistical ideas, ensure the appropriate application of a technique and emphasise the correct interpretation of the results.

We have represented the use of statistics as a tool for research by means of a relational diagram of the elements of the research process (Fig. 1).

Figure 1: Elements of the Research Process
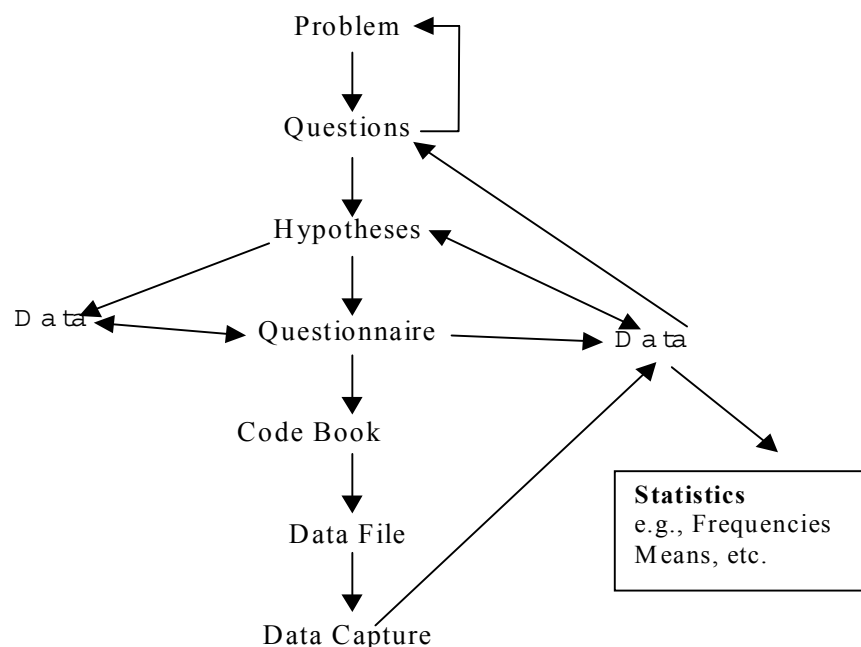
In Fig. 1, we see that the research process begins with a problem. This is articulated in the form of research questions that in turn are formulated as hypotheses. The hypotheses give rise to a questionnaire and subsequently the related codebook. From the codebook we are able to prepare an appropriate data file ready to receive the data. After administration of the questionnaire, the process of data capture takes place. The process

of data analysis may now be carried out. Both the hypotheses and the questionnaire have a direct influence on the actual data collected, while the hypotheses and the questionnaire influence the data analysis. Data analysis, which requires the use of statistical procedures, may now proceed and be used eventually to provide answers to the research questions posed earlier. Although this may be a simplified view of the research process, it serves to provide a perspective for the important step of data analysis and the use of statistical techniques

However, as all researchers are aware, the process of research is not linear as Fig. 1 appears to imply. Although the outcomes of data analysis provide answers, be they partial or complete, to the research questions, they invariably raise more questions and the whole process loops back to the problem and sets off another cycle of research. This cyclic approach to research has been used by a number of researchers and is clearly articulated by Bishop and Talbot (2001). They call the elements of the cycle Problem, Plan, Do, Study, Act (PPDSA). The five stages of an investigation are described as follows:

- *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*: Analyse and interpret the data;
- *Act:* Modify one's view of the problem in the light of the data.

The PPDSA cycle is a useful model for guiding novice researchers through the research process. The conventional forms of statistical analysis that we stress are summarised in Table 1 and Table 2. Descriptive statistics are used to describe the basic features of the research data. They provide simple summaries about the sample and the measures. Together with simple graphics analysis, they form the basis of virtually every quantitative analysis of data:

> *With descriptive statistics you are simply describing what is, what the data shows"* (Trochim, 1999, p. 250). Inferential statistics *"investigate questions, models and hypotheses. In many cases, the conclusions ... extend beyond the immediate data ... Thus, we use inferential statistics to make inferences from our data to more general conditions ..."* (Trochim, 1999, p. 250).

Table 1: Major Forms of Statistical Analysis

Descriptive Statistical Analysis	Inferential Statistical Analysis
This is used to enable the researcher to organise and summarise the data to render the results more comprehensible.	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.

In many instances, a major part of social science research is qualitative in nature and may for, example, involve interviews with volunteer respondents. The approaches of quantitative (statistical) and qualitative analysts are thus quite different. A quantitative researcher carries out the 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).

Table 2: Structure of Descriptive Statistical Analysis

Univariate Analysis	Bivariate Analysis	Multivariate Analysis
Used to identify properties of single variables	Used to identify relationships between two variables	Used to identify relationships among several variables
Nominal/ordinal data, e.g., race, gender, clas	Nominal/ordinal data, e.g., race, gender, class	Nominal/ordinal data, e.g., race, gender, class
Examples: percentages, mode, median, range	Example: Spearman's rank correlation	Example: correspondence analysis
Interval data, e.g., age, income, test score	Interval data, e.g., age, income, test score	Interval data, e.g., age, income, test score
Examples: mean, standard deviation.	Examples: Pearson product-moment correlation, regression.	Examples: principle component analysis, multiple regression.

It is important for the researcher to determine whether or not the results obtained from the sample data may be generalised to the population. This leads naturally to the use of inferential statistics to estimate population parameters or test hypotheses. In qualitative research, however,

"the investigator usually works with a wealth of rich descriptive data, collected through methods such as participant observation, in-depth interviewing and document analysis. The research strategy is usually of a contextual nature ... (and makes) use of methods of data analysis that are more holistic, synthetic and interpretative" (Mouton, 1996, p. 169).

For researchers who make use of questionnaires for collecting data, the twin issues of reliability and validity are crucial. Reliability deals with the accuracy and consistency of measurement and asks, 'Will the same methods used by different researchers and/or at different times produce the same, or similar, results?' The different forms of reliability and the appropriate measures, e.g., test-retest (correlation), equivalent form (correlation) split halves (correlation), internal consistency (Cronbach alpha), are discussed in terms of the contest in which they arise. Validity, which addresses the soundness or effectiveness of a measuring instrument, asks, 'Does the instrument measure what it is supposed to measure?' There are several forms of validity, e.g., face, criterion, content and construct, and all are discussed as and when needed.

5. WORKSHOPS

To clarify our approach, we now give examples from some of our workshops. The first was primarily 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. The others were aimed at introducing researchers to more sophisticated multivariate techniques. In each workshop, we adopted an experiential, hands-on approach, with all participants using a PC with SPSS and a suitable data set. Instruction was provided through the medium of a PC and data projector, supported where necessary by transparencies on an overhead projector.

In the first workshop, after the introduction a general overview of SPSS was provided. Participants were helped to access SPSS and navigate their way through

several layers of windows. They were then introduced to the idea and need for creating a codebook and the related data file. This was done by providing participants with an extract from a survey questionnaire and copies of five completed questionnaires. Using an interactive question-and-answer session, participants worked in pairs to create their own copies of the codebook. Participants were then introduced to the procedure for preparing a data file and, using the newly created codebooks, proceeded to enter data from the questionnaires. After data capture the need for data checking and cleaning was dealt with, leading naturally into data analysis. For this purpose, participants were provided with copies of the full research data set, which was then used, for the introduction and use of frequencies, cross-tabulations, tables, graphs, descriptive statistics and correlation. The comparison of means using t-tests and one-way analysis of variance was also explained.

As much as possible, we avoided simply telling participants what to do, relying instead on asking questions about the data and obtaining ideas from them about what could or should be done. In this way, participants were lead naturally to suggest appropriate routes for the analysis and we were able to introduce the relevant statistical ideas within the context of the specific data set.

On other occasions, workshop participants were provided with access to larger data sets that were used as vehicles for driving the analysis and developing understanding of principal component analysis, correspondence analysis, multiple regression and CHAID. Briefly, for those unfamiliar with it, CHAID (Chi-squared Automatic Interaction Detector) is a sophisticated segmentation modelling method for analysing large quantities of categorical data (Kass, 1980). In the workshop on regression, for instance, participants were introduced to the concept of visualising relationships using scatter plots. After sufficient exploration of a number of relationships, simple and multiple regression ideas were developed, with participants being encouraged to provide suggestions for the analysis and challenged to give meaningful interpretations to the results. The workshops have not attracted large numbers of participants, but have drawn staff and students from a wide range of subject areas. This is shown in Figures 2, 3 and 4 in which details of attendance at three workshops are given.

Figure 2: Summer School (1998) - Writing for Publication (N=32)
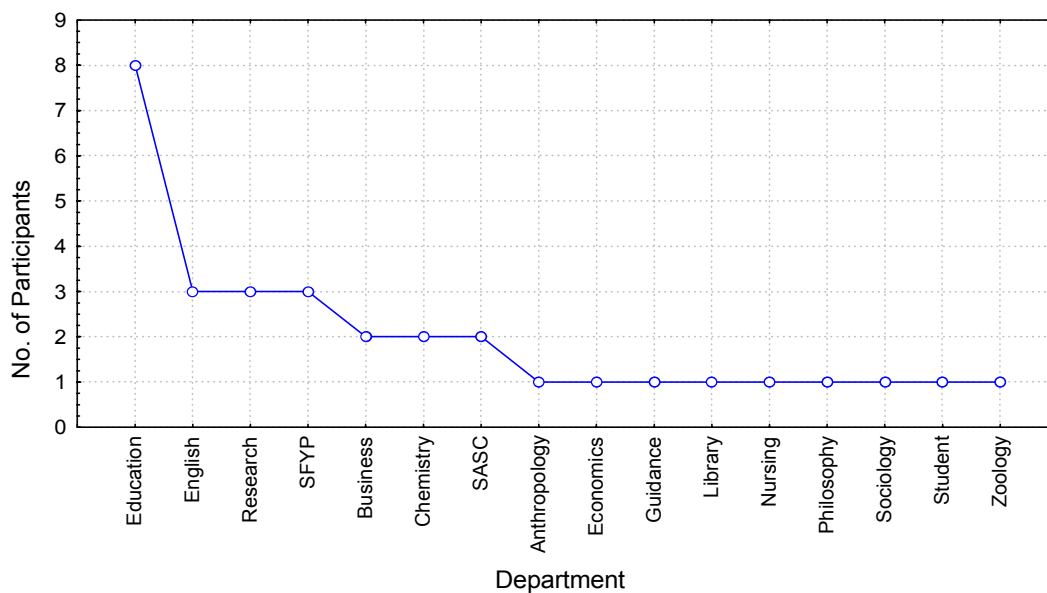
As with any educational task, we have experienced problems in presenting workshops. An unexpected one for us has been the lack of computer literacy among staff and students alike. This has included unfamiliarity with the use of a mouse and a general lack of understanding of a windows environment. Fortunately, workshop participants have responded positively to most situations and progress has been good once the initial handicaps have been overcome. A more serious difficulty is the general lack of familiarity with and formal knowledge of basic statistical ideas. The background levels range from almost nil to one or two people with experience of multivariate techniques. We have found that introducing statistical ideas only within the context of a particular research project and its data set has been beneficial and less threatening to workshop participants.

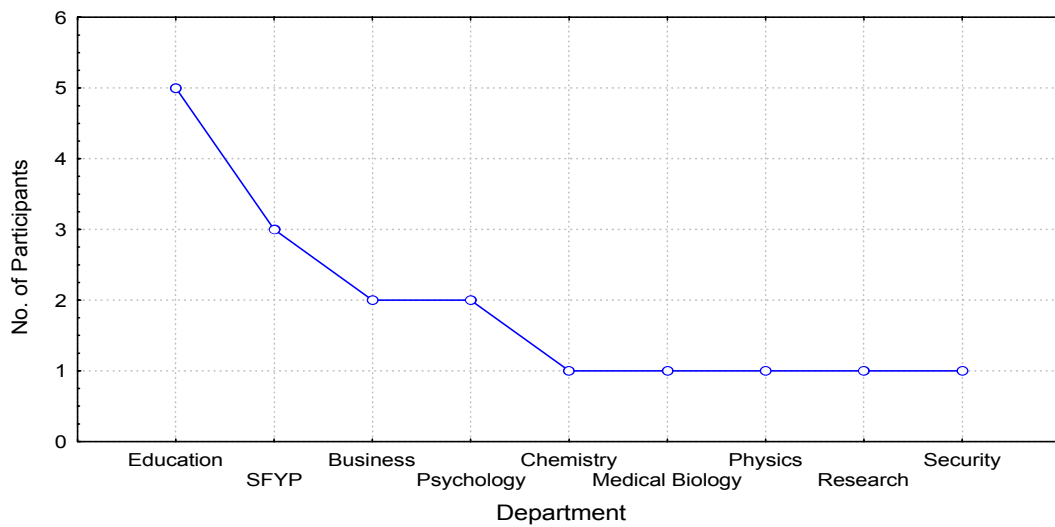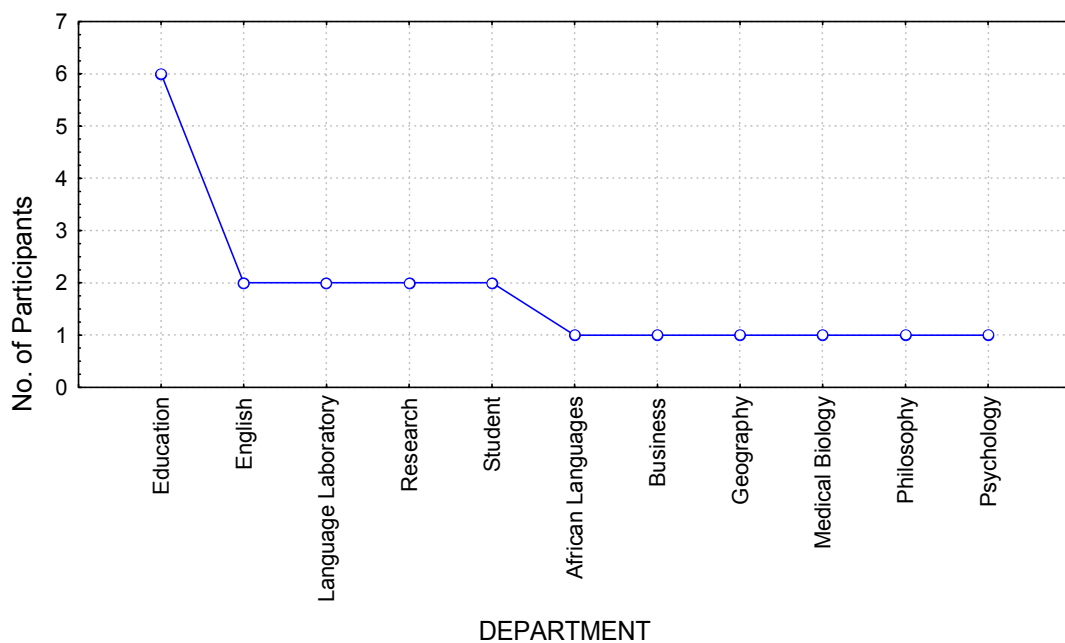*Figure 3: Workshop 5 (1999) - Creating a Codebook (N=17)*

Figure 4: Workshop 5 (2000) - Research Instrument Design (N=20)

<center>6. QUALITY ASSURANCE</center>

South Africa today is facing a multitude of social and educational changes. With new academic policies being promoted and the recent developments in terms of the Minister of Education's "Size and Shape" initiative, universities are rapidly adjusting to the need to operate efficiently, productively and economically (Kotecha & Luckett, 2000). It is widely acknowledged that education offers

> *"the high road to economic productivity, some measure of social equality and democracy in the modern world"* (Singh, 2000, p. 5).

In order to achieve a competitive edge in the global economic and educational scenarios of the 21st century, quality checks are essential. Quality checks are also necessary to ensure the effective implementation of curricula and the concomitant assessments, not only to ensure competitiveness, but also to ensure the professional and personal development of academic staff in higher education (Mammen, 1999). There is a clear need

> *"to devise new ways of evaluating our educational programmes and accounting for what we do"* (Singh, 2000, p. 6).

The successful transformation of higher education requires, as a non-negotiable matter, the development of some form of quality assurance. The establishment of a considerable number of quality assurance units in recent years is a reflection of this concern (Mammen, 2000). Within the boundaries of South Africa, the South African Qualifications Authority (SAQA) Act (SAQA Act, 1995), the report of the National Commission on Higher Education (NCHE) (NCHE, 1996), the South African Higher Education Act of 1997 and the subsequent establishment of the national Higher Education Quality Committee (HEQC) have collectively laid the foundation for quality assurance in the post-apartheid South African higher education (Mammen, 2000). As noted by Singh (2000):

> *"This relatively new national and international phenomenon has mushroomed into a fast growing industry ... (although) the complexities surrounding the development of quality assurance ... cannot be overestimated."* (Singh, 2000, p.7).

The necessary new structures and their corresponding new demands are already having an impact on busy academics and administrators, with some regarding quality assurance as

> *"a threat to their academic freedom and autonomy"* (Singh, 2000, p.7).

It is thus both understandable and not surprising that attempts to implement quality assurance practices have met with strong resistance in many educational circles.

Singh (2000) makes the pertinent observation that quality assurance asks fundamentally important questions of all of us, questions that should be part of our normal activities. For example:

> *"What am I trying to do or achieve? Why am I doing it in that way? ... What is the context in which I am doing it? How do I know that it is effective and that I am doing a good job? Is*

this the best possible way of doing it? Was it worth it, after all? And so on" (Singh, 2000, p. 7).

Quality assurance involves, *inter alia*, internal self-evaluation. We have done this by keeping detailed records of the daily use of the Centre and attendance at workshops and seminars. Quality assurance also involves some form of independent external evaluation. The Centre was evaluated by the National Research Foundation in November 1999. The report was generally positive and enthusiastic about the work being done and the effect of the Centre on the research community in the university, although weaknesses were identified and suggestions for improvement were made.

7. PROPOSED DEVELOPMENTS

In order to consolidate the position of the Centre within the University and to enable a controlled expansion of the services provided by the Centre, a three-year Strategic Plan has been drawn up and a proposal for additional funding submitted to the National Research Foundation. The Strategic Plan makes provision for the following developments:

- The establishment of two Junior Research Fellowships. They are intended for registered master's students who would provide additional support in the day-to-day running of the Centre. Junior Research Fellows will be required to work a specified number of hours per week in the Centre. This will involve assisting with a variety of research projects and being involved with the expanded consultancy services to be offered by the Centre in 2001.
- The establishment of two Research Fellowships for registered doctoral students. In addition to additional support in the day-to-day running of the Centre, Research Fellows will assist with the development of individual, departmental and university research projects. They will also be involved with the expanded consultancy services to be offered by the Centre in 2001.
- The establishment of one Senior Research Fellowship at post-doctoral level. This will be used to enable an experienced researcher from outside the University to spend three to six months here and contribute to the growth and development of research expertise and excellence within the University.
- The provision of additional research resource materials. These include additional computers as well as books and research-focused computer software. For example, there is a growing need for at least one computer package for qualitative data analysis, while a variety of specialist packages for quantitative data analysis would enhance the versatility of the Centre.

8. SUMMARY

In this paper, we have provided a view of the role of the Research Resource Centre at the University of Transkei in the training of social science researchers. We have attempted to provide a contextual perspective of a Centre that is vital for the facilitation and development of research capacity among researchers at a university in a rural underdeveloped area of South Africa. We have highlighted the objectives of the Centre

and described its functions, which are not restricted to the social sciences. However, we have focussed on the researchers in the social sciences and described an approach to the research and statistical education of this group. Our approach is one that encourages and promotes experiential, hands-on, active participation in all aspects of the research process. We especially espouse a conceptual approach to the learning of statistics (see for example, Weldon, 1986). Although we make use of standard statistical packages, e.g., SPSS and Statistica, not every possible research situation is accounted for in such packages. In these instances, we have found a valuable resource to be that of Silver and Hittner (1998), which is effectively a compendium of statistical software programs for the more adventurous researchers.

The role of the Research Resource Centre is essentially that of a facilitator. We have responded to people's needs as and when they arose. More importantly, we have endeavoured to anticipate such needs by providing a range of workshops, short courses and research seminars that collectively promote a positive environment for researchers. How successful we have been is reflected in a recent external evaluation of the Centre. The Centre,

> *"leans towards quantitative approaches to research and has a strong emphasis on developing quantitative research methods and skills. (It) has been the most effective RRC in disseminating research information, promoting and informing researchers about (research) programmes and grants, and providing on-site services and support"* (Simons & Subotzky, 2000, p. 19).

We were, nevertheless, criticised for an over-emphasis on quantitative research methods, something we are attempting to deal with.

No researcher who deals with social issues of any kind, whether at a theoretical or practical level, can do so effectively without reference to empirical information - the facts or the data. As is generally known,

> *"statistics generally has a bad reputation among social science students"* (Bless & Kathuria, 1998, p. v).

The reasons are not entirely clear. Statistical reasoning is not particularly difficult, while the ubiquitous computer and the accompanying statistical packages have made the tedium of lengthy calculations a thing of the past. It is our considered opinion that a Research Resource Centre such as ours has a pivotal role to play in facilitating research capacity development and research excellence within the University generally and particularly in the research training and statistical education of social science researchers.

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Michael Glencross and Andile Mji
Research Resource Centre University of Transkei
Private Bag X1, Unitra, Umtata, South Africa 5117
E-mail: glencros @ getafix.utr.ac.za, mji @ getafix.utr.ac.za