A THIRD WORLD UNIVERSITY'S STUDENTS' PERSPECTIVES OF STATISTICS

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In this age of information technology vast amounts of data are generated from many different processes which necessitate the practice of statistics in some form or other. Many third world students grapple with understanding the subject of statistics and the success of teaching statistics depends on finding a satisfactory answer for many of the questions asked by the majority of students. The primary aim of this study is to investigate the role that perspectives play in the learning of statistics in a third world setting for students just beginning to study statistics at university. This paper highlights the misconceptions that students have about statistics and suggests that dispelling the myths and prejudices may ease teaching of the subject and acceptance of statistics as a rewarding career. Ninety-eight first year statistics students participated in the study through a 40- item self-administered questionnaire at the beginning of the semester. The paper also suggests directions for further research in the third world teaching of Statistics.

INTRODUCTION

There is growing interest among university students in studying statistics. In this paper, it is hypothesized that their success as students and the success of the instructor are largely influenced by their prior perceptions of statistics as a subject. This paper focuses on the perception issues in the North-West province in South Africa. This area is semi-rural third world environment that is far from heavily industrial or commercial centres. The approach used is relating factors of merit that indicate prior opinions or bias, such as the perception of ease, interest, gender, ability and so on. The relationships between these factors and actual or perceived performance were quantified by a variety of tests, such as the chi-square test, the *t*-tests and un-rotated factor analysis. The role of preconceptions is to help understand the readiness to learn statistics and can provide a meaning communality to propagate the subject matter. In this investigation, the sample consisted of first year students, with varied backgrounds and academic histories.

Several studies of attitudes of students learning statistics have been carried out. A common vein that appears in many of these researches is the waning interest in studying statistics, not the least because the subject is considered unappealing. It has also been established that perspectives play a statistically significant role in helping the student understand both the statistical theory and statistical practice thereby deciding both purpose and delivery modes (Sowey, 1998). Other studies of student perspectives have concentrated on inquiries into student preferences of the style of instruction. Such studies have indicated that while there has been no significant increase in the percentage of students preferring non-traditional approaches to instruction, there are a greater number of students who considered it preferable (Johnson, 2005).

The various sources of misconceptions may understandably be rooted in the misuse of statistics by sources such as the press or media, something that almost everyone is exposed to on a daily basis. The role of the press and society in acting as a suppressant, especially in as far as gender bias is concerned is not to be underestimated. These sentiments eventually become inherent in the better performance of males over females (Felder *et al*., 1995).

In the particular environment of the sample, the role that prior learning plays is formally recognized by the institution, and embodied in a policy, referred to as Science Foundation and also Recognition of Prior Learning (RPL). The latter is a mechanism to recognize non-formal learning for students who have not followed what is considered the mainstream, but for one reason or other engaged in environments that have practices that are considered suitable prerequisites.

Aims of the Study

The aim of this study is to investigate the role that perspectives play in the learning of statistics in a third world setting for students just beginning to study statistics at university. The objectives are to:

i. understand the influence of demographic variables in the learning of statistics,
ii. establish factors that students perceive as detrimental or as useful to their learning of statistics.

DATA ANALYSIS AND RESULTS

The analysis used a five-point Likert scale with the following responses: strongly agree, agree, uncertain, disagree, and strongly disagree. The sample consisted of 98 first year statistics students who were administered a 40-item questionnaire.

RELIABILITY ANALYSIS

Reliability analysis of the data yielded a Cronbach alpha of 0.77 indicating strong internal consistency (Carmines *et al.,* 1979).

DEMOGRAPHIC ANALYSIS

The demographic analysis shows that 98% are between the ages of 15 and 25 with a mean age of 20.6 years. 98.8% of the students are enrolled fulltime and 86.7% are not majoring in statistics. 13.3% plan to major in statistics. 94.9% of students did not study any statistics at the high school. 97% of the students interviewed are black and 81.2% are Tswana speaking. 64.3% of the students have a rural home background.

T-TESTS ON GENDER BIAS

The Satterthwaite method was used for the analysis because the Equality of Variances in all cases is greater than the 5% level of significance.

The analysis suggests that there is little difference in the perception of statistics between male and female students. A p-value greater than 5% means that there is no significant difference in perceptions between the two groups. The exceptions are in regard to the statements:

'Statistics develops my analytical and problem solving skills' (p-value = 0.0167),
'The lecturer gives me feedback on my work' (p-value = 0.0056), and
'I always have a lot of work, more than I can do' (p-value = 0.0052).
'The population census is an important exercise' (p-value = 0.0073).

T-TESTS ON MAJOR-SUBJECT CHOICE

A *t*-test on subject suggests that a difference does exist depending on the choice of major subject. The p-values suggest that statistics major students are more motivated than non-statistics major students. This fact comes out clearly in regard to the keenness to use computers, the willingness to purchase prescribed textbooks and a general attitude toward the enjoyment of statistics. In addition, the use of library services seems more focussed among majors than among non-majors. Majoring students seem to have higher semester marks than non majoring students. Students who have done high school statistics and have a strong mathematical background seem to perform better than those who did not do high school statistics and mathematics.

DIFFERENCES IN STATISTICAL ABILITY

The chi-square test results show that there is an association between statistical ability and choice of major subject and the mathematical background of the student.

FACTOR ANALYSIS

The following six factors were extracted by un-rotated factor analysis:

i. Factor 1: applicability
ii. Factor 2: perceived workload
iii. Factor 3: computing ability

    iv.   Factor 4: feedback on learning
    v.   Factor 5: statistical packages
    vi.   Factor 6: availability of computers

These six factors accounted for a total of 46.5% of the total variance explained.

CONCLUSIONS

This paper investigated the factors that students perceived as detrimental or instrumental to their learning of statistics. The study of these factors of perception can prove to be very useful to instructors of statistics in as far identifying the myths and fallacies that students come with into the learning environment. This can give purpose and a more effective structure to the course. The results suggest that biases do exist in this setting and dispelling the negative attitudes then becomes of central importance to the instructor. The results also suggest that the perceptions of statistics are gender equitable. This was surprising because the study suggests that mathematics is perceived as requisite to statistics, but traditionally, females shied away from the more technical subjects. The study also establishes that the perception of the role of computer literacy in statistics learning is underestimated. This could be due to the view that statistics is a pure science without the need of practical data analysis. This undermines the application of abstract classroom concepts to real life situations and problems. A connected factor is the perceived uncertainty of employment prospects.

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