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***Pankaj Mohanty*** Business Statistics as Viewed by B-School Students  
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#### **Book Reviews:**

***R.M. Naidu*** From Third World to First

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## Business Statistics as Viewed by B-School Students

Pankaj Mohanty and Chandra Sekhar SF

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### Abstract

*Management is science and art. As part of science, it deals with the subject of statistics for testing and validating concepts and theories for effective practice. The concepts and the models employed in almost all the natural and social sciences also employ statistics for decision making. Similarly, the utility and the dependability of statistics has also made inroads into business management education, since its inception, aiding managers to make critical decisions for business effectiveness. However statistics as a subject is not everybody's cup of tea, especially for all those students who are not from mathematics background. For some, experiencing statistics is a nightmare and for others, extra laboring for understanding the subject. Such premise is addressed in this study utilizing the data collected from 295 students pursuing various post graduate diploma program in management from a premier B-school in the twin cities of Hyderabad and Secunderabad. A standard questionnaire, which included attitude towards statistics scale, along with questions relating to demographic background of the students was administered and the results were of mixed reactions. A majority of the students were moderate in their attitude, followed by nearly one fourth of them having less positive attitude towards statistics. Further demographics did not have any influence on the attitudes. Implications are drawn for further research and practice.*

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### Introduction

Teaching statistics in the context of business management and including examples of typical managerial work may better prepare students for their career. However there is one major situation that needs to be addressed in the problem of students in learning statistics. Every faculty member in statistics, when asked a question regarding what ails in the teaching of statistics to the student of business management, would answer "I wish I had all students with interest in learning statistics". This situation is characterized by the general attitude students have towards statistics and of course the faculty members.

As a matter of fact, the teachers make improvements to their teaching methodologies in order to ensure that all the students develop conducive attitudes towards the subject and consequently

learn the same. Thus, there is an immediate need for diagnosing the students attitudes towards statistics as a subject through organized research and explore better ways of improving such attitudes, in case needed, for effectiveness of teaching and learning effectiveness on the part of students.

Attitudes are evaluative statements, favorable or unfavorable related to person, object or event. They reflect how one feels about something. To that effect, here it is the subject of statistics and the student's likes and dislikes about the subject are the case in point. (Krosnick and Smith, 1994). Although previous research has suggested that the student attitude towards statistics has been negative (Mills 2004), effect from faculty member and the like have been more intensive towards statistics improving such attitude of the students. Owing to

such state of affairs, many b-schools have evolved their statistics curricula either downwards or upwards while scaling the quantum of inputs in their 1<sup>st</sup> year and 2<sup>nd</sup> year of the program.

### **Some Research Studies**

Research on students' learning has been a very prominent issue in social sciences like psychology, sociology etc. However, such studies in business management are very scarce. There are several earlier research studies which have highlighted the importance of students attitudes towards statistics owing to the prominence of such attitude in influencing the scientific temper in the students. Some significant studies are presented in the following sections.

Gal and Ginsburg (1994), critiques current instruments for assessing attitudes and beliefs of students, and explores assessment methods teachers can use to measure students' dispositions regarding statistics. assessing attitudes towards statistics are ill-suited for the tasks identified, due to: (1) exclusive use of Likert-type scales, (2) the inclusion of items that are not appropriate for students who have not had extended experience with statistics, or who are not at a very advanced stage of their career development, (3) the tendency not to seek explanations from subjects for their answers, (4) the practice of using total scores which aggregate responses to different item types, and (5) inattention to the links between attitudes towards statistics and other constructs. Gal and Ginsburg (1994, p. 4) further suggest that a similar process likely occurs in statistics education and that “. . . it is important

that statistics educators have access to assessment instruments that enable an initial diagnosis of their students' attitudes and beliefs and also enable monitoring of the status of such attitudes and beliefs during a course.”

Further, Vanhoof et al., (2006) revealed that this important relationship between attitudes toward statistics and statistics performance was content-specific. The relationship between attitudes toward statistics and total exam results was not statistically significant.

In view of such need, Tsao (2006) indicated that, the constructivist-based learning approach technique encouraged students to become more positive attitudes toward statistics with the course content through active-learning environment. Williams (2010) Results indicated that instructor immediacy is significantly related to six factors of statistics anxiety, with immediacy explaining between 6% and 20% of the variance in students anxiety levels. Instructors should attempt to increase their use of immediacy behaviors in order to decrease anxiety. Carnell L, J. (2008) suggests that inclusion of a project may not significantly impact students' attitudes toward statistics. Evans, B. (2007) shows Significant correlations were found between student attitudes and achievement, both at the beginning and end of the course. A low, but significant, correlation was found between positive attitudes toward statistics and accurate conceptions about statistics in the post-test but not in the pre-test.

Similarly, Vanhoof, et al. (2006) study shows a positive relationship is found

between students' attitudes toward the use of statistics in their field of study and the dissertation grade. Dempster and Mc Corry (2009) the present research has clarified further the nature of these relationships. Using a longitudinal design, the present research has shown that statistics assessment outcome is correlated more highly with specific attitudes held at the time of the assessment rather than attitudes about statistics which are held by students at the beginning of their statistics course. Furthermore, an attitude about cognitive competence is more strongly related to assessment outcomes than previous experience with maths, statistics or computing.

Schild and Schild (2003) presents the results of Schau's longitudinal survey showed a statistically significant increase in students' feeling of cognitive competence and a statistically significant increase in the difficulty of the course. While 61% of Augsburg students saw an increase in their value or appreciation of statistics, this difference was not statistically significant.

Roberts and Saxe (1982) found that SAS scores were found to be significantly related to such cognitive variables as basic mathematics skills, statistics pre knowledge, and course grades. Unsurprisingly, statistics exam performance among psychology students is positively related to previous experience of statistics (Schutz et al 1998) and of maths (Lalonde and Gardner 1993; Schutz et al 1998).

From these studies, it is quite evident that the studies focusing on the attitude

towards statistics is examined from multiple directions in the lives of students and the institutions where they studied as well. Besides, there are some uniform patterns focusing on the type of course, gender, environment in which the student learns the subject, competence levels of the students, examination performance and quite other factors that influence such attitudes.

### **The Present Study**

In response to the change in the curriculum, the learning style of the students and the teaching style of the faculty addressing the attitude of students towards statistics is of greater interest to all the concerned in the management education. Such attitudes are important because they encourage the learning process of the students. Besides they also help in improving belief about statistics and useful statistical thinking skills (Gal, et.al 1997) however negative attitude towards statistics may inhabit learning of statistics on the part of students (Fullerton and Umphrey, 2001).

Previous research findings revealed that students in general have anxiety, cynicism, fear and contempt. Further, there are also instances wherein the student employs defense mechanisms of blaming the faculty members for not properly teaching the subject. Faculty members on the other hand counter such complaints. However, understanding about such reasons is beyond the confines of this research.

The present study addresses the students' attitude towards statistics is assessed and then further cross tabulated with the demographic variables to understand

whether such attitude depends on demographic variables. Firstly, it attempts to assess the attitudes of students towards the subject of statistics using standardized instrument. This way, the levels of attitudes of the students can be assessed. Secondly, the level of attitude towards statistics needs to be analyzed in relation to the demographic factors in order to know whether such factors have any influence on the attitudes.

The maturity of understanding by a student may improve according to the age of the students. Therefore, younger people may have the curiosity to learn more effectively than the older people. Similarly, such trend may be applicable to their progressive attitude towards statistics. Further, males and females also have their attitudes varying towards the subject of statistics accordingly. In other words, females tend to spend more time reading and writing as such they may have better attitude towards statistics than males who generally are diverse in their activities and roles and as a result may not develop better attitude towards such subject. Besides, medium of instruction also may have its impact on the learning of the subject of statistics. Those who are from English medium might have better attitude than those who are from non-english backgrounds. Intermediate and graduate education, if involving mathematics and statistics, all the more, will improve their attitudes towards statistics and lastly, the specialization course chosen by the students may also influence their attitudes towards statistics. Thus this study has two fold purposes; firstly it assesses the attitude towards statistics of the students. Secondly it expresses the

association between demographic profile and the attitudes towards statistics.

### **Objectives and Hypothesis**

In the light of the problems stated and the purpose of the study, the following objectives are formulated highlighting the broader purpose of the research.

- I. To assess the students attitude towards statistics
- II. To analyze the attitude towards statistics in relation to the demographic variables of the students.

Next, while keeping the objectives in mind, it is hypothesized that “there is an association between students’ attitude towards statistics and their demographic variables like age, gender, medium of their instruction, intermediate, graduation, specialization and the course”.

### **The Method**

The present study is undertaken in one of the largest B-Schools in South India, which admits 420 students per annum, across six Post Graduate Diploma in Management Programs which is rated in the top 30 among the Indian B-schools. The school is 20 years old supported by the society which is celebrating its golden jubilee year. 295 students out of 420 have responded to the structured questionnaire which included standardized scale for measuring attitude towards statistics developed by “Schau, et al.” (1995). The 40-items scale employed seven point likert type responses (where strongly agree = 7 and strongly disagree = 1). The coefficient of alpha of the overall scale when computed yield a value of 0.89 indicates that the scale is highly reliable. In order

to present the results, cross-tabulation are made treating attitude towards statistics as dependent variable and demographic as independents variables. The hypothesis has been tested using chi-square on the entire cross tabulation of student's attitude towards statistics and demographic variables.

### Results and Discussion

The results are presented in two sections. Firstly, the levels of attitude towards statistics have been obtained using quartile values from the actual score distribution of attitude scale. Secondly, the hypothesis testing has been done

using cross-tabulations and chi-square tests.

### Attitude towards Statistics

In order to find out the levels of attitude towards statistics, the actual scores obtained by the respondents on the 40-item scale scores computed by adding up all the score points. Details in this regard are presented in table 1. The level of attitude towards statistics needs to be generated while grouping the score ranges. This was done with the help of quartile values. Results in this regard are presented in table no-1.

It is clear from the table that the scores

Table 1

#### Levels of Attitude towards Statistics

Sno	Level of Attitude	Quartile Values	Score range	Frequency	Percentage
1	Less Positive	Q1 = 102	66-102	72	24.2
2	Moderately Positive	Q2 = 103 Q3 = 121	103-121	153	52.2
3	More Positive	Q4 = 122	122-189	69	23.5
	Total			293	100.0

lesser than first quartile (Q1) value of 102 are labeled as less positive attitude. Values above fourth quartile (Q4) of 122 are labeled as more positive attitude. And lastly the score between the second and third quartile are labeled as moderate attitude towards statistics.

As regards the status of the attitude towards statistics presented in the table, it is evident that clearly one fourth of the students held less positive attitude towards statistics (24.2%), followed by a majority of them (52.2) held moderate attitude towards statistics. The remaining

of them are having more positive attitude towards statistics (23.5%).

### Demographics and Attitude towards Statistics

It was hypothesized that "there is an association between students' attitude towards statistics and their demographic variables like age, gender, medium of their instruction, intermediate, graduation, specialization and the course". Results regarding testing of this hypothesis are presented in table 2.

Table No 2: Attitude towards Statistics and Demographics

Sno	Demographic		Attitude Towards Statistics				Total	$X^2$	P =
			Less Positive	Moderate	More Positive				
1	Age (in years)	20-23	57	113	46	216	3.351 (d.f = 2)	.187	
			26.4 %	52.3 %	21.3 %	100.0 %			
		24-28	14	40	23	77			
			18.2 %	51.9 %	29.9 %	100.0 %			
Total	72	153	69	293					
2	Gender	Male	54	120	54	228	.287 (d.f = 2)	.866	
			23.7 %	52.6 %	23.7 %	100.0 %			
		Female	18	34	15	67			
			26.9 %	50.7 %	22.4 %	100.0 %			
Total	72	154	69	295					
3	Medium of Instruction	English	55	122	55	232	6.44 (d.f = 6)	.37	
			23.7 %	52.6 %	23.7 %	100.0 %			
		Hindi	7	20	10	37			
			18.9 %	54.1 %	27.0 %	100.0 %			
		Telugu	6	4	1	11			
			54.5 %	36.4 %	9.1 %	100.0 %			
Total	72	154	69	295					
4	Intermediate Course	Commerce	14	48	18	80	5.122 (d.f = 4)	.27	
			17.5 %	60.0 %	22.5 %	100.0 %			
		Science	57	103	48	208			
			27.4 %	49.5 %	23.1 %	100.0 %			
		Arts	1	3	3	7			
Total	72	154	69	295					
5	Course in Graduation	BA	5	6	7	18	19.18 (d. f = 10)	.038	
			27.8 %	33.3 %	38.9 %	100.0 %			
		B.Sc.	14	39	25	78			
			17.9 %	50.0 %	32.1 %	100.0 %			
		BBA	3	9	3	15			
			20.0 %	60.0 %	20.0 %	100.0 %			
		B.Tech	30	47	11	88			
			34.1 %	53.4 %	12.5 %	100.0 %			
B.Com	17	51	20	88					
	19.3 %	58.0 %	22.7 %	100.0 %					
BCA	3	2	3	8					
Total	72	154	69	295					



Sno	Demographic		Attitude Towards Statistics				Total	X <sup>2</sup>	P =
			Less Positive	Moderate	More Positive				
6	Specialization in Post-Graduation	Marketing	37 20.7 %	96 53.6 %	46 25.7 %	179 100.0 %	7.544 (d.f = 4)	.110	
		HRM	11 24.4 %	21 46.7 %	13 28.9 %	45 100.0 %			
		Finance	24 33.8 %	37 52.1 %	10 14.1 %	71 100.0 %			
		Total	72	154	69	295			
7	PG Programme	PGDM-Marketing	17 18.5 %	44 47.8 %	31 33.7 %	92 100.0 %	10.235 (d.f = 6)	.115	
		PGDM-HRM	10 26.3 %	19 50.0 %	9 23.7 %	38 100.0 %			
		PGDM-Triple Specialization	34 25.6 %	75 56.4 %	24 18.0 %	133 100.0 %			
		PGDM-BIFAAS	11 34.4 %	16 50.0 %	5 15.6 %	32 100.0 %			
		Total	72	154	69	295			

**Age group and Attitude:** From the above table it is evident that there are more people in the older age group (29.9%) held more positive attitude towards statistics than those who had less positive attitude in younger age group (26.4%). Surprisingly the calculated Chi- Square (X<sup>2</sup> value is found lesser than the tabulated value, indicating that such association between age and attitude towards statistics is statistically insignificant.

**Gender and Attitude:** As regards gender, there are more people in male category (23.7%) held more positive attitude towards statistics than those who had less positive attitude in female category (26.9%). Nevertheless, the calculated Chi- Square (X<sup>2</sup>) value is found lesser than the tabulated value. Therefore,

such association between gender and attitude is statistically insignificant, indicating that gender does not influence attitude towards statistics. Surprisingly, Bilgin and Crowe (2008) showed that there were no significant differences in the approaches to learning of local and international; and male and female students; however, the study found a significant difference between undergraduate and postgraduate students, with postgraduates more likely to adopt deep strategies to learning.

**Medium of Instruction and Attitude:** As evident from the table, that equal number of people from English medium are either having highly (23.7%) or less positive (23.7%) attitude towards statistics, a little over one fourth of those with Hindi medium back ground (27%)

held more positive attitude towards statistics than those who are from Telugu medium (54.5%) who held less positive attitude towards statistics. Surprisingly the calculated Chi-Square ( $X^2$ ) value is found lesser than the tabulated value. Therefore the association between Medium of Instruction and attitude is statistically insignificant. In other words, medium of instruction does not influence attitude towards statistics.

***Intermediate background and Attitude:*** The above table also suggests that nearly one fourth of the people with commerce back ground held more positive attitude towards statistics (22.5%) than those who had less positive attitude in the same group (17.5%). similarly, in case of those who are with Art background, a large number of them are either moderately positive (42.9%) or more positive (42.9%). in case of those who are with science background, a little over one fourth (27.8%) are having less positive attitude than others. The calculated Chi-Square ( $X^2$ ) value is found lesser than the tabulated value. Therefore such association between age and attitude is statistically insignificant. Surprisingly, the student's attitude does not depend on the type of intermediate course chosen by them.

***Graduation and Attitude:*** It is evident from the above table that among graduates with BA, a little over one third (38.9%), are having more positive attitude than others. Similarly, nearly one third of those who are with B.Sc (32.1%) are having more positive attitude than others.

As regards B.com graduates nearly one

fourth of them (22.7%) are more positive attitude towards statistics than others. On the contrary, among B-tech graduates, a little over one third of them (34.1%) and among BCA graduates (37.5%) are having less positive attitude than others. The calculated value of Chi-Square ( $X^2$ ) is found greater than the tabulated value. Therefore such association between graduation background and attitude is statistically significant. Thus, attitude towards statistics is influenced by the type of course chosen during graduation.

As regards the progression of studies from intermediate and graduation, Aksu and Bikos (2002) results are quite similar to that of Dauphinee, Seha, and Stevens (1997), where Math/Sciences students have the most positive feelings about learning statistics Math/Sciences. Tsao (2006) indicated that, the constructivist-based learning approach technique encouraged students to become more positive attitudes toward statistics with the course content through active-learning environment.

***Specialization and Attitude:*** The table clearly indicates that, majority of the students with Marketing (53.6%), HRM (46.7%) and Finance (52.1%) specializations held a moderate attitude and very less percentage of people have a positive attitude towards statistics than those who either had less positive or more positive attitude. Surprisingly the calculated Chi-Square ( $X^2$ ) value is found lesser than the tabulated value. Therefore such association between Specialization of students and attitude is statistically insignificant. Further, this could mean that such attitude does not depend on the type of specialization chosen by the students.

**Course and Attitude:** The above table clearly shows that there are more people in PGDM-Marketing Course hold more positive attitude towards statistics (33.7%) than those who had less positive attitude among students of PGDM-HRM (26.3%), TPS (25.6%) and BIFAAS (34.4%). The calculated Chi-Square ( $X^2$ ) value is found lesser than the tabulated value. Therefore such association between types of course of students and attitude towards statistics is statistically insignificant. Further, it means that the student's attitude towards statistics does not depend on the type of course chosen by them. On the contrary, Pierce et al. (2008) suggests that students' attitudes toward statistics for the most part declined over the course of the semester. Their study provides further evidence for the need to adjust statistics teaching methods such that student attitudes are more positive toward statistics.

As it was hypothesized that "there is no association between students' attitude towards statistics and their demographic variables like age, gender, medium of their instruction, intermediate, graduation, specialization and the type course", seven cross-tabulations were made with chi-square computations. Surprisingly, only one chi-square test yielded significant association. This indicates the hypothesis is rejected and null hypothesis is accepted.

### **Implications and Conclusion**

This study reveals that students have more positive attitudes (though in varying degrees) about statistics than negative, a finding that coincides with some previous research (Kennedy & McCallister, 2001; Perney & Ravid, 1990; Waters et al.,

1988).

Though more students are having less positive attitudes in this study, it could be attributed to various reasons including the background of the students in various non-quantitative ones. Besides, the teaching of statistics also would have affected every level of education. When statistics concepts are introduced as early as the elementary level, students are less likely to dislike and not understand statistics. This issue needs to be addressed by all the apex bodies of regulating educational standards in our country. Second, though few teachers use the computer as a tool to supplement their instruction in an effort to assist students in their statistics learning. The combination of technology with teaching statistics has offered students the opportunity to concentrate more on learning concepts instead of calculating complex formulas and losing focus of the practical meaning of results. As a result, the practical application of statistics as a science is realized. Therefore, statistics courses in the elementary and secondary level as well as an improvement in the instruction and research related to statistics education is almost certainly impacting student attitudes about statistics. Providing examples more relevant to the lives of the students and supplemented with the examples gradually scaling to the context of business management need to be used by the faculty members. Besides, those students who are scholastically poor need to be given special attention while providing additional inputs and by identifying exactly the problem areas that need improvement. Besides, team based

assignments need to be given to the students. Here two kinds of students need to be grouped including those who are good and those who are not good in statistics. Let the team members help each other in the project and learn about the subject of statistics. This way, the attitudes could be improved.

Cross tabulation of demographic variables and attitude towards statistics revealed interesting results, however chi-square values could not produce significant association between the study variables except in case of courses chosen during graduation. Thus, the null hypothesis is accepted. In other words, student's attitude towards statistics does not depend upon the demographics. Therefore it is imperative to have a new research design that reflects on psychographics and their influence on the attitude towards statistics. Implications are drawn for improving statistics while suggesting how faculty members can improve the interest students have in the subject. Besides how students can also focus on their personal weakness and start working over them.

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