Scholars Journal of Physics, Mathematics and Statistics **ISSN 2393-8056 (Print)**
Sch. J. Phys. Math. Stat. 2016; 3(1):6-14 **ISSN 2393-8064 (Online)**

(An International Publisher for Academic and Scientific Resources)

Students' Attitudes towards Statistics for Business: A Pre – Learning Experiences

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Abstract: Business Statistics has become essential and relevant to business individuals, allow them present and describe business data and information properly, make reliable forecast about a business activity and improve business processes as well. Recent studies reported that student's attitudes towards statistics play an important role in their course achievement. Students with positive attitude towards the course are expected to show strong positive performance in statistics courses. On the other hand, a negative attitude towards the course will be an obstacle in learning the course effectively. Understanding attitudes towards the course from undergraduate business students is significant, considering that many of them have been exposed to quantitative courses and hence take assumptions of their ability and interest to their business education programme. A survey instrument, Survey of Attitudes Towards Statistics (SATS) was employed to determine attitude level towards business statistics course. Six contributing factors on attitude level were considered which are affective, cognitive, capability, value, difficulty, interest and student's effort. The aim of this study is to determine the student's attitude level towards statistics for business prior to learning experiences. This study has also investigated the relationship between the student's previous performance in mathematics, number of quantitative courses taken and attitude components.
Keywords: business statistics, pre-learning experiences, quantitative courses, SATS, student's attitude, undergraduate.

INTRODUCTION

Statistics has become part of the curriculum in some programs in the tertiary level. Statistics is vital especially to higher education level. It introduces to the students the important concepts and techniques in generating, analyzing, presenting and interpreting data for useful information. Business Statistics is a mandatory course in the curriculum in some programs in the College of Business, Entrepreneurship and Accountancy of Cagayan State University, which aims to expose the students towards basic statistical concepts and techniques applicable in research, industry and most especially to business and economics. Courses content includes sampling techniques, presentation of data (both qualitative and quantitative data), descriptive measurements like central tendency, variability, skewness and peakness. The subject also includes probability, normal distribution and random and discrete variables. The students were also exposed to inferential statistics which are hypothesis testing and statistical analysis like the parametric and non-parametric tests.

Most students viewed statistics as hard course because of its mathematical formulae and computations. In fact, according to Judi *et.al* [8] statistics courses are often considered difficult because it involves many fundamental concepts and techniques. These findings can also be proven from the different conducted studies by many researchers. In addition, according to Ashari et al [1], students feel that the course is not relevant to their field of study, as well as for their future career and thus resulted to negative attitude towards the course. Student's interest and enjoyment of the course can also be factors in measuring attitudes towards the course. Other factors also mentioned by Judi, *et.al* [8] like negative attitude makes them feel tired to undertake the course, incapable of appreciating the benefits of statistics, unable to focus in the class, tend to interfere during class progress and absent.

On the other hand, a positive attitude towards the course resulted to a better performance of the students. Moore [10] and Mills [9]suggest that active learning methods should be employed, such as by emphasizing statistical thinking and data processing, instead of using theory and formula alone. According to Nolan *et.al* [7], improving students' attitudes through educational interventions may also increase confidence in their ability to understand statistical information and problem-solve using statistics beyond the classroom. Students' attitudes towards statistics may play an important role in their statistics achievement, affecting the learning of statistics, understanding statistical concepts and

methods, and developing useful statistical thinking skills needed to apply statistics knowledge [2]. In addition, according to Gomez [3], teaching business statistics courses to undergraduates should focus on understanding statistical results and its association with business problems. Thus, application of statistical concepts and methods must be given priority rather than spending time in the definite details of formulae and computations. Hence, a positive attitude could be achieved for this purpose since students could be able to see and appreciate the significance of the course most especially when applied to their daily living and field of study.

The use of designed SATS instrument was surveyed to the students to determine the attitude of the students towards the course prior to their exposure to the basic concepts, knowledge and skills in business statistics to capture their attitudes on the course. This study has also examined the association between the student's previous performance in mathematics, number of quantitative courses taken and attitude components.

RESEARCH OBJECTIVES

Generally, this study was carried out to determine the attitude level among undergraduate students towards statistics for business prior to learning experiences. Specifically, this study was surveyed to the answer the following statements:

1. What are the demographic factor of the respondents in terms of
    a. sex
    b. age
    c. program
2. What are the student's attitude level towards the course?
    a. Affective factor
    b. Cognitive capability factor
    c. Value factor
    d. Difficulty factor
    e. Interest factor
    f. Effort factor
3. Is there a significant relationship between the student's previous performance in mathematics, number of quantitative courses taken and attitude components?

RESEARCH METHODOLOGY

Participants

The participants were enrolled in business, accounting and legal management program under College of Business, Entrepreneurship and Accountancy of Cagayan State University Second Semester SY 2015-2016 taking up Business Statistics course. They were asked to fill up a survey form prior to exposure to statistics course in the programme to capture their attitudes towards statistics before learning the course. Utilization of the survey instrument was permitted to the author, Candace Schau. The number of samples were randomly chosen and estimated by Slovin's formula ($n = 250$) together with $\alpha = 0.05$.

Instrument

In order to measure student's attitude towards statistics a survey instrument namely, Survey of Attitudes Towards Statistics (SATS) was develop and copyrighted by Candace Shau[4] which assesses both cognitive and non-cognitive factors have been utilized in this study. SATS is one of the most widely used instruments assessing statistics attitudes.

There are two versions of the SATS, namely SATS 36 and SAT 28. The new version (SATS 36) was being utilized in this study and has 36 items of the survey form with six attitude components which are affective, cognitive, value, difficulty, interest and effort of the students. Affective factor measures student's feelings regarding statistics; Cognitive competence measures about their intellectual knowledge and skills when applied to statistics; Values on the other hand, measures student's attitude on usefulness, relevance and worth of statistics in personal and professional life; Difficulty measures student's attitudes about difficulties of the student in understanding the subjects; Interest is a component that assesses their interest on the course; and lastly, effort is the amount of work the students plan to expand to learn statistics.

Responses to each statements on the survey instrument were scaled from a 7-point likert scale, 1 being the strongly disagree while 7 for strongly agree. Of the 36 statements, for analysis purposes, 19 were negatively worded and they were reverse coded transforming it to positive wordings, e.g. "I have no application for statistics on my profession". Higher scores indicate more positive attitudes towards statistics. Demographics of the samples were also included in the instrument, like sex, age, college program and their majors. Students were also asked on their past mathematical

achievement, their performance in mathematics in the past (high school or college) on a scale of 1 to 7 where 1 represents very poor while 7 represented very well. They were also asked the number of quantitative subjects, either math or statistics in their high school and college. According to Schau[4], to provide useful information, SATS must be administered at least twice (as a pretest and post test) but can be administered frequently.

Statistical Analysis

Cronbach's alpha was employed to calculate the internal consistency of responses to all 36 items on the SATS survey instrument and the six attitude components. The computed Cronbach's alpha is high ($\alpha = 0.863$). The reliability of each factors ranged from $\alpha = 0.72$ for affective, 0.71 for cognitive capability factor, 0.73 for value, 0.40 for difficulty, 0.77 for interest and 0.65 for effort. Almost similar values of alpha reported in the study of Ashaari [1].

Mean was employed to assess student's feedbacks to towards each attitude item in the survey form. A high score means a high positive attitude towards the course. The interpretation on the student's attitude towards the course is being interpreted by Zamalia[5] and categorized as positive if the mean score is 4.50 to 7.00, neutral for 3.51 to 4.49 and negative for 0.00 to 3.50.

Frequency counts and percentages were used to summarize the demographic factor of the students. Spearman's correlation coefficient was employed to measure the strength of association between student's previous performance in mathematics, number of quantitative courses taken and attitude components.

RESULTS AND DISCUSSION

Table 1. Demographic Information of Respondents

		Frequency	Percent
Sex	Female	188	75.2
	Male	62	24.8
Age	16.00	2	.8
	17.00	83	33.2
	18.00	107	42.8
	19.00	38	15.2
	20.00	12	4.8
	21.00	3	1.2
	22.00	2	.8
	24.00	2	.8
	27.00	1	.4
Program	BSBA-FM	119	47.6
	BSBA-MM	53	21.2
	BSLM	47	18.8
	BSAT	31	12.4

Table 1 shows the demographic factor of the respondents; out of 250 respondents 188 or 75.2% are female while the rest are male with a frequency count of 62 or 24.8%. Most of the respondents are 18 years old with a mean of 18.05, the fact that the course is being taught regularly in the second year level. It can also be viewed from the table that most of the respondents are taking Bachelor of Science in Business Administration (BSBA) major in Financial Management with a frequency count of 119 or 47.6% while 53 or 21.2% is taking BSBA major in Marketing Management. The rest of the respondents are BS in Legal Management (BSLM) and BS Accounting Technology(BSAT) with a frequency count of 47 and 31 respectively.

Table 2. Frequency of high school math, college math courses completed and number of units earned toward the degree

Program	No. of high school math/statistics courses completed *	No. of college math/statistics courses completed (regular students)**	No. of credit hours earned toward the degree (regular students) **
BSBA-FM	4	2	90
BSBA-MM	4	3	90
BSAT	4	3	96
BSLM	4	3	96

Source: * Department of Education, ** www.csuheeds.edu.ph (based on their curriculum)

Table 2 presents the number of high school mathematics, college mathematics completed and number of credit hours earned toward the statistics course. According to the Department of Education, students should be able to finish 4 math subjects from first year to fourth year level to be able to graduate in the secondary level. During their college, Financial Management majors had already finished two (2) mathematics courses prior to statistics course, namely College Algebra and Mathematics of Investment. While the rest of MM, BSAT and BSLM had already finished three (3) mathematics courses namely: College Algebra, Mathematics of Investment and Business Calculus. In addition, BSBA students had finished 90 units while 96 units for BSAT and BSLM prior to statistics course.

Table 3.Summary of current grade point average and expected grade of the respondents

	Current grade point average		Expected grade for the course	
	Frequency	Percent	Frequency	Percent
95 and above	0	0	28	11.2
90-94	3	1.2	83	33.2
85-89	84	33.6	117	46.8
80-84	139	55.6	14	5.6
79 and below	13	5.2	1	.4
no response	11	4.4	7	2.8
TOTAL	250	100.0	250	100

Table 3 presents the summary of current grade weighted average (GWA) of the respondents. It reveals that most of them (139 or 55.6%) had a GWA between 80-84 while 84 or 33.6% had a GWA of 85-89. Only few had a GWA of above 90 and below 80. The mean GWA is 84.95 with standard deviation of 2.81. Furthermore, most of the students had a very high grade expectation to the course that is 83 or 33.2% and 28 or 11.2% had a grade estimation of 90-94 and 95 and above respectively. The mean grade expectation to the course is 88.29 with standard deviation of 6.98.

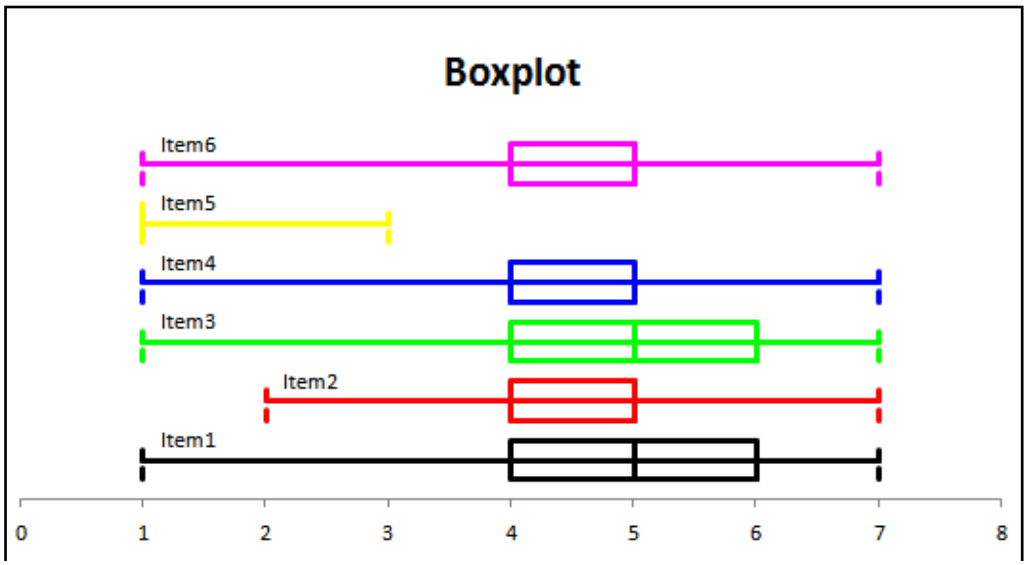

Fig.1: Summary on additional information of respondents using boxplot

Table 4. Descriptive Statistics for Item 1 to Item 6

Five-Number Summary	Item1	Item2	Item3	Item4	Item5	Item6
Minimum	1	2	1	1	1	1
First Quartile	4	4	4	4	1	4
Median	5	5	5	4	1	5
Third Quartile	6	5	6	5	1	5
Maximum	7	7	7	7	3	7

Table 4 illustrates additional information of the respondents prior to math achievement of the students. In item1, the students were asked, "How well was your performance in mathematics courses which you had taken in the past?" Possible response would be 1 as very poorly, 4 as neutral and 7 as very well. It can be viewed on the boxplot figure that

the median value is 5 which shows that their performance in their previous mathematics courses is most likely good. While in item2, on the cognitive competency of the students, 1 as very poor while 7 is very good. It can also be revealed from the figure that students are quiet good in mathematics with a median score of 5. Meanwhile, in item3 students gave a high positive response when they asked about their application of statistics after finishing school where they get to be employed someday, possible responses are 1 as not all confident and 7 as great deals. It can be viewed from the boxplot with a median score of 5. On the other hand, respondents marked a neutral response for item4 about the mastery of statistics material. As you can see in item5 from the boxplot, students are mandatory to take the course as included in their curriculum. Furthermore, students scored a positive response in item6, "If you were asked to choose, how likely is it that you would have chosen to take any course in statistics?" possible responses are 1 as not at all likely, 4 as neutral and 7 as very likely. The median value for this item is 5.

Table 5. Mean Score for Affective Factor

Affective Attitude Factor	Mean	SD
s3. I will like statistics.	5.48	1.27
s4*. I will feel insecure when I have to do statistics problems.	4.16	1.53
s15*. I will get frustrated going over statistics test in class.	4.49	1.44
s18*. I will be under stress during statistics class.	4.27	1.48
s19. I will enjoy taking statistics courses.	5.06	1.17
s28*. I am scared of taking statistics.	4.62	1.71

*negative statement but transformed to positive wordings when scoring (1 becomes 7, 2 becomes 6, etc.)

Table 5 presents the mean score for each item under affective attitude factor towards the course. Respondents have shown a highly positive attitude for items s3 (mean = 5.48), s19 (mean=5.06) and s28 (mean = 4.62). A neutral response was displayed for items s4 (mean = 4. 16), s15 (mean = 4.49) and s18(4.27). No negative responses were recorded by the students.

Table 6. Mean Score for Cognitive Capability Attitude Factor

Cognitive Capability Attitude Factor	Mean	SD
s5*. I will have a problem in understanding statistics because of how I think.	4.26	1.40
s11*. I will have no idea of what's going on in this statistics course.	4.84	1.65
s26*. I will make a lot of math errors in statistics.	4.61	1.46
s31. I can learn statistics.	6.18	1.02
s32. I will understand statistics equations.	5.73	1.13
s35*. I will find it difficult to understand statistical concepts.	3.81	1.51

*negative statement but transformed to positive wordings when scoring (1 becomes 7, 2 becomes 6, etc.)

For cognitive capability attitude component (Table 6), the respondents gave a high positive responses towards item s31(mean = 6.18), s32(mean = 5.73) , s11(mean = 4.84) and s26 (mean = 4.61). Neutral response was shown for items s5(mean = 4.26) and s35(mean = 3.81). It can also be concluded from the lowest mean that student will experience difficulties to understand statistical concepts but a very high positive attitude that they can learn statistics course.

Table 7. Mean Score for Value Factor

Value Attitude Factor	Mean	SD
s7*. Statistics is worthless.	5.97	1.45
s9. Statistics should be a required part of my professional training.	5.31	1.38
s10. Statistical skills will make me more employable.	5.50	1.27
s13*. Statistics is not useful to the typical professional.	5.48	1.40
s16*. Statistical thinking is not applicable in my future profession.	5.46	1.53
s17. I use statistics in my everyday life.	5.35	1.48
s21*. Statistics conclusions are rarely presented in everyday life.	3.64	1.69
s25*. I will have no application for statistics in my profession.	5.12	1.50
s33*. Statistics is irrelevant in my life.	4.74	1.58

*negative statement but transformed to positive wordings when scoring (1 becomes 7, 2 becomes 6, etc.)

Table 7 demonstrates mean scores for each component of student's value towards statistics course. They have given a high positive response towards all items (s7, mean = 5.97; s9, mean = 5.31; s10, mean = 5.50; s13, mean = 5.48; s16, mean = 5.46; s17, mean = 5.35; s25, mean = 5.12; and s33, mean = 4.74) except for item s21(mean = 3.64) which shows a neutral response towards the course.

Table 8. Mean Score for Difficulty Factor

Difficulty Attitude Factor	Mean	SD
s6. Statistics formulae are easy to understand.	4.09	1.10
s8*. Statistics is a complicated subject.	3.78	1.47
s22. Statistics is a subject quickly learned by most people.	4.21	1.39
s24*. Learning statistics requires a great deal of discipline.	2.14	1.22
s30*. Statistics involves massive computations.	2.55	1.29
s34*. Statistics is highly technical.	3.18	1.11
s36*. Most people have to learn a new way of thinking to do statistics.	2.60	1.30

*negative statement but transformed to positive wordings when scoring (1 becomes 7, 2 becomes 6, etc.)

Based on table 8 regarding difficulty level, the students exhibited a neutral response on item s6 (mean = 4.09), s8(mean = 3.78), s22(mean = 4.21) and s34(mean = 3.18). The remaining items were given a negative response, which are s24(mean = 2.14), s30 (mean = 2.55) and s36(mean = 2.60).

Table 9. Mean Score for Interest Factor

Interest Attitude Factor	Mean	SD
s12. I am interested to communicate statistical information to others.	5.51	1.29
s20. I am interested in using statistics.	5.32	1.22
s23. I am interested in understanding statistical information.	5.68	1.25
s29. I am interested in learning statistics.	6.08	1.10

Table 9 illustrates the mean scores for each factor under student's interest towards the course. They have agreed a high positive response in all items (s12, mean = 5.51; s20, mean = 5.32; and s23, mean = 29). This reveals that student shows an interest prior to learning the course.

Table 10. Mean Score for Effort Factor

Effort Attitude Factor	Mean	SD
s1. I plan to complete all of my statistics assignment	5.87	1.40
s2. I plan to work hard in my statistics course.	6.14	1.04
s14. I plan to study hard for every statistics test.	5.98	1.05
s27. I plan to attend every statistics class session.	6.08	1.39

Table 10 shows that mean scores of the students under effort attitude factor. Students have given a high positive response in all items (s1, mean = 5.87; s2, mean = 6.14; s14, mean = 5.98 and s27, mean = 6.08).

Table 11. Mean Score for Each Attitude Factor

Attitude Factor	Mean	Interpretation
Affective	4.68	positive
Cognitive Capability	4.91	positive
Value	5.17	positive
Difficulty	3.22	*negative*
Interest	5.65	positive
Effort	6.02	positive

Table 11 indicates the mean summary score of the six attitude factors towards the statistics course. The analysis shows a positive attitude towards affective, cognitive capability, value, interest and effort with a mean of 4.68, 4.91, 5.17, 5.65 and 6.02 respectively. Meanwhile, a negative attitude was recorded for difficulty factor with a mean of 3.22.

Their personal feelings towards the course were slightly positive like frustration, insecurities, stress, enjoyment and worry. Student's intellectual knowledge and skills in the course are more likely positive. This shows that they are confident enough to learn statistics; they will not commit errors along the course; and easy to understand statistics equations and concepts.

Moreover, students will give enormous effort towards the course like intension to finish their statistics assignments, plan to work and study hard on the subject and plan to attend every class sessions. Even though this course is difficult still they will exert effort and show interest towards the course. Student shows interest in the usefulness of the course and interest in understanding statistical information and in learning the course.

Meanwhile, students also realized the significance and usefulness of the course in their personal life and future profession. In fact, they responded that the statistical skills and thinking that they will acquire from the course will make them more employable in their chosen career.

On the other hand, students confirmed that they will experience difficulty on the course because of its nature like mathematical formulae, massive computations and highly technical. In fact, according to Judi *et.al* [8], statistics courses are often considered difficult because it involves many fundamental concepts and techniques. Other factors like poor basic education foundation, teacher factors like teaching style and methods, and course syllabi design are also reasons for obscurity but it's not proven and beyond the scope of this study.

Table 12. Correlation of attitude component, previous performance in mathematics and number of quantitative courses taken in primary degree

Attitude component		Previous performance in mathematics	Number of quantitative course taken
Affective	r-value	.300**	.079
	p-value	.000	.216
Cognitive Competence	r-value	.277**	.076
	p-value	.000	.231
Value	r-value	.177**	-.010
	p-value	.005	.878
Difficulty	r-value	.043	.241**
	p-value	.499	.000
Interest	r-value	.327**	.010
	p-value	.000	.873
Effort	r-value	.189**	-.049
	p-value	.003	.443
**. Correlation is significant at the 0.01 level (2-tailed).			
*. Correlation is significant at the 0.05 level (2-tailed).			

Table 12 explains the relationship between attitude component, previous performance in mathematics and number of quantitative courses taken in their primary degree. It can be viewed that there is a significant relationship between perceptions of performance in mathematics in the past and all of the factors of attitude excluding difficulty. This explains that the better the perceptions of pervious performance in mathematics in the past the more positive attitudes towards the course. Furthermore, this indicates that prior experiences or a previous performance in mathematics is an important predictor in assessing the attitude level of the students in statistics. Meanwhile, the number of previous quantitative courses taken was moderately positively correlated with difficulty means that the more courses a student had taken the less the perception of difficulty towards the course. Statistically, no relationship has been recorded in other factors in relation to the number of quantitative courses taken.

CONCLUSION

Positive attitude towards statistics was shown in all items in value, interest and effort factor which shows that students really value the significance of the course in their daily living, give much effort and interest in learning the course. Students were found to show a positive attitude in most items in affective and cognitive factors. Although, they find this subject difficult, still they had put much effort and interest to master the concepts of the course. The following items were displayed positive by the students:

1. I will like statistics.
2. I will enjoy taking statistics course.

3. I am not scared of taking statistics.
4. I will have an idea of what's going on in this statistics course.
5. I will not make a lot of math errors in statistics.
6. I will understand statistics equations.
7. Statistics is not worthless.
8. Statistics should be a required of my professional training.
9. Statistical skills will make me more employable.
10. Statistics thinking is applicable in my future profession.
11. I use statistics in my everyday life.
12. I will have an application for statistics in my profession.
13. Statistics is relevant in my life.
14. I am interested in being able to communicate statistical information to others.
15. I am interested in using statistics.
16. I am interested in understanding statistical information.
17. I am interested in learning statistics.
18. I plan to complete all of my statistics assignment.
19. I plan to work hard in my statistics course.
20. I plan to study hard for every statistics test.
21. I plan to attend every statistics class session.

Negative attitude towards statistics was recorded under difficulty component. Difficulty component measures student's attitudes about difficulties of the student in understanding the subjects. The following are negative responses recorded by the students:

1. Learning of statistics requires a great deal of discipline.
2. Statistics involves massive computations.
3. Statistics is highly technical.
4. Most people have to learn a new way of thinking to do statistics.

Students with positive attitude show a maximum effort to master the course, they will enjoy the course, they believed that they have intellectual capacity, they recognized the benefits of the course in their chosen career and will give much effort to learn statistics course. Almost the same finding of previous researches by Judi *et.al* [8].To overcome learning difficulties of students towards statistics course, application of statistical concepts and methods must be given priority rather than spending time in the definite details of formulae and computations. Dempster and McCorry[6] suggested that student's perceptions in their math ability must be enhanced. According to him, remedial teaching of basic mathematics is required to improve students' mathematics ability and improve their confidence in approaching the subject of statistics before the statistics curriculum begins. Maybe explicit information about the difference between statistics and mathematics would also help in the formation of more positive attitudes toward statistics at the beginning of the curriculum.

RECOMMENDATION

Creating interactive graphs and tables through statistical software must also be introduced and demonstrated to the students for them to develop their statistical analysis towards the course and in order to eliminate negative attitudes towards the course. To encourage students to learn and to apply statistics particularly in business, educators in statistics should avoid complicated statistical formulae and computations. Since an attitude towards statistics is vital, then we need to evaluate our instruction, course design and course outcomes. Researchers may also utilize the post test SATS instrument designed by Schau for future study to compare the attitude level of the students both at the beginning and at the middle of the course or at the end of the course.

ACKNOWLEDGMENTS

The authors would like to thank the students in giving priceless response in this study and to Ms. Candace Schau for allowing the author to use the instrument. The SATS instrument is available from the author: Candace Schau(CS Consultants, LLC, Albuquerque, NM 87111; cschau@comcast.net).The pretest and posttest versions of the SATS-36 can be viewed at: http://www.evaluationandstatistics.com.

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