

## Helping Alleviate Statistical Anxiety with Computer Aided Statistical Classes

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*Abstract: This study, Helping Alleviate Statistical Anxiety with Computer Aided Statistics Classes, investigated whether undergraduate students' anxiety about statistics changed when statistics is taught using computers compared to the traditional method. Two groups of students were questioned concerning their anxiety about statistics. One group was taught statistics using the traditional "calculator and paper/pencil" method while the other group was taught statistics using computers to perform the required calculations. Frequency distributions and the chi-square test of independence indicated there were significant differences between the two groups. Students in the computer class had significantly less statistical anxiety than students in the traditional class.*

*Keywords: statistics, statistical anxiety, computer, SPSS, teaching methods.*

### I. Introduction.

Most undergraduate students experience moderate to considerable anxiety when faced with their first undergraduate statistics class. This anxiety stems from many sources including the dread of taking another college level math class, discussions with other students about how they have 'suffered', or just plain 'fear of the unknown.' This apprehension about taking statistics is referred to as "Statisticophobia" (Dillon, 1982). In addition, students may fail to see the relevance of statistics for their criminal justice careers. Accordingly, they may delay taking the course until their very last semester, thus allowing anxiety to build unnecessarily. One difficulty, then, of teaching statistics is overcoming "Statisticophobia" so that students can learn statistics while enjoying the class.

One of the primary sources of fear and anxiety about statistics is caused by the very nature of statistics. In a traditional statistics class, students have heard 'horror' stories from other students about using a pencil and a calculator to solve complex statistical formulas. Then, at the start of the semester, students buy a textbook, go back to their dorm room or apartment, open the book, and see formulas that look like this:

$$t = \frac{M1 - M2}{\sqrt{S^2_{m1} + S^2_{m2}}}$$

Consequently, this is going to cause anxiety about taking statistics.

During the 2003 – 2004 academic year, a decision was made to change how introductory statistics was taught at Texas State University | San Marcos. The change was made from teaching statistics the traditional "calculator and paper/pencil" method to teaching statistics through

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computer. The primary goal of this change was to make statistics more ‘user friendly’ and, hopefully, re-focus the students from merely performing the required calculations to understanding statistical theory and the appropriate use of statistical processes. The purpose of this study was to investigate whether using computers changed students’ attitudes toward statistics.

## **II. Literature Review.**

Statistics is required for graduation in criminal justice programs at almost all accredited universities with the required statistics course being followed by a course in research methods. Often, the thought of facing statistics with the accompanying fear of failure causes severe consternation to most students in a criminal justice program (Kennedy and McCallister, 2002). Thus, being able to successfully teach statistics so that students can succeed in statistics and research methods has become important in present day criminal justice programs (Bushway, Shawn, and Flower, 2002).

Dillon (1982) noted that a primary source of statistical anxiety is the fear of taking a complicated college level math class. Her attempts in alleviating this anxiety were having her students express their fears by answering questionnaires detailing their feelings about statistics and combining this with a lecture on math anxiety. Dillon reported that this procedure eased the students’ fears to the point where they could master statistical concepts (Dillon, 1982).

Journal writing has also been tested as a method of reducing statistical anxiety. For example, Sgoutas-Emch and Johnson (1998) compared a group of undergraduate students who participated in journal writing to a group that did not in order to determine whether there was a difference in statistical anxiety between the two groups. Sgoutas-Emch and Johnson found that the group that participated in journal writing had improved grades, less anxiety before exams, and lower physiological reactions (Sgoutas-Emch and Johnson, 1998).

One of the authors has experienced statistical anxiety in his college teaching career and has attempted to alleviate it several ways. In his first semester of teaching introductory statistics, the author tried to lessen the student’s anxiety by having a math review session followed by a simple math test, followed by a demonstration about how data and statistics are useful in everyday life using examples from football and basketball. Unfortunately, it did not work and the students appeared to be just as anxious after the lecture as before it.

One newer strategy teachers use to reduce statistical anxiety is by incorporating computer use into statistics classes (Collins, Oberg, and Shera, 1989). Kennedy, McCallister, and Corliss (2001) investigated whether using computers as the focus of instruction in an advanced statistic class, together with an individualized, self-paced, student-centered, activity-based course, positively impacted student attitudes about statistics. The respondents, 15 graduate students in an advanced statistics class and 4 graduate students in a multivariate statistics class were questioned about their attitudes regarding statistics at the beginning and end of the course. The survey results indicated that the students’ attitudes about statistics improved over the course of the semester. Kennedy et al. attributed this improvement to the use of computers in the classroom (Kennedy, McCallister, and Corliss, 2001).

Kennedy, McCallister, and Corliss (2002) used this same methodology when they reexamined whether using computer positively impact attitudes about statistics. In this second study, 43 graduate students in an advanced statistics class were taught using computers as the focus of instruction in an advanced statistic class, together with an individualized, self-paced,

student-centered, activity-based course. As in the previous study, the students were questioned about their attitudes regarding statistics at the beginning and end of the course. The survey results confirmed the findings of the previous study and indicated that students' attitudes about statistics improved over the course of the semester. As in the previous study, Kennedy et al. attributed this improvement to the use of computers in the classroom (Kennedy, McCallister, and Corliss, 2002).

Results indicate that using computers in a statistics class has been generally successful in lowering statistical anxiety. For instance, Ware and Chastain (1989) investigated whether using computers in an undergraduate statistics class significantly impacted the students' attitudes about statistics. In this study, the researchers compared attitudes about statistics from students in a computer aided statistics class to attitudes about statistics from students in a non-computer statistics class. The results indicated a significant difference between the students' attitudes with the students in the computer aided class having significantly more favorable attitude about statistics than students in the class without computers (Ware and Chastain, 1989).

Using computers in the classroom has also been shown to increase statistical knowledge. Lane and Aleski (2002) took advantage of a redesign in undergraduate statistics classes to examine whether using computers and collaborative learning methods influenced student performance. Prior to the redesign, statistics classes were taught in a traditional lecture style format to sections of 240 students by full time faculty. After the changes, the courses were more student-centered than instructor-centered with students having one session each week in one large lecture session (240 students) and two sessions in a computer lab (40-60 students). The faculty member taught all three classes and a graduate student teaching assistant was present in the computer lab. A content knowledge test was administered to the students at the beginning and the end of each semester. The results of this study found that students' overall performance was higher in the redesigned classes than in the traditional course (Lane and Aleski, 2002).

The intent of the current study was to investigate whether there was a difference between students' attitudes toward statistics depending on whether computers were used as a teaching aid in an introductory statistics class. Specifically, it was hypothesized that the student's attitudes about statistics would be more favorable for students taught statistics using a computer than students taught statistics using the traditional method.

### **III. Methods.**

#### *A. Research Design.*

The *ex post facto* research design was selected for this project because it was closest available to the specific teaching situation presented (Cook, 1979). One of the recognized problems associated with this design is attempting to eliminate any selection bias since there is no pre-test to use as a comparison. This potential problem was addressed in the survey instrument when the respondents were asked how strongly they wanted to take statistics and why they took the class. The responses to these questions indicated there was not a significant difference between the attitudes of the two groups of students (non-computer vs. computer class) prior to taking the class (See results section below). The students registered for the computer courses did not report different levels of enthusiasm or motivations for taking the course compared to those in the non-computer course, indicating that selection bias associated with those factors did not exist or, at the most, was minimal.

Another potential problem associated with this research design is attempting to eliminate any bias caused by the instructor and teaching materials (Cook, 1979). The potential problem resulting from instructor bias was addressed by using the same instructor and teaching methods for both computer and non-computer classes. The primary difference between the classes was the addition of *How to Use SPSS* by Brian C. Cronk for the computer-based class (Cronk, 2004). This book was used only to teach the students how to use SPSS. While it is not possible to say that instructor bias was completely eliminated, after all, it is reasonable that the same instructor might perform somewhat differently in different classrooms and with different students. It is believed that any instructor bias that might still exist was of minimal impact on the results of this study.

### *B. Subjects.*

The subjects consisted of students enrolled in an undergraduate criminal justice statistics class at Texas State University | San Marcos for fall 2003, and spring and summer I 2004. A total of 88 students were tested, 40 from the fall 2004 (non-computer) class and 48 from the spring and summer 2004 (computer) classes. Of these respondents, there were 24 male and 16 female students for the non-computer class. There were 22 male and 25 female students in the computer classes.

### *C. Survey Instrument.*

The questions comprising the survey instrument were borrowed from a combination of four sources. The first source for questions was the Scales Test developed by Fennema-Sherman (Fennema and Sherman, 1976). The second source for questions originated from the Students' Attitude Toward Statistics Test developed by Sutarso (Sutarso, 1992a, 1992b). The third source for questions was the School of Education – University of Virginia Course Evaluation form (Braskamp, Brandenburg, and Ory, 1984). Finally, questions were asked that specifically applied to the issues investigated by this project.

The survey instrument was a Likert scale questionnaire that queried the students about general and individual attitudes toward statistics. The general attitudinal questions included questions such as, 'learning statistics is mostly memorizing,' 'statistics is interesting,' 'statistics is mostly about symbols and formulas rather than about ideas,' and 'in statistics, knowing why an answer is correct is important.' The individual questions included: 'my interest in statistics has increased over the semester,' 'overall, this class was useful to me,' and 'I would rate the value of this course to me as \_\_\_\_\_,' to gauge whether there was a bias in the students either for or against enrolling in this class. A copy of the survey instrument is attached as Appendix I.

### *D. Procedure.*

The undergraduate Statistics for Criminal Justice class at Texas State University | San Marcos is an introductory upper-level statistics class taught to criminal justice majors. Usually, the classes consist of juniors and seniors. According to the 2002-2004 undergraduate catalog, the expectations for this class are:

The theory and application of statistical inferential techniques, and correlation and regression for behavioral science data and its application in Criminal Justice. Emphasis is on the collection, analysis, and interpretation of statistical data in criminal justice settings (Texas State University | San Marcos undergraduate catalog, <http://www.txstate.edu/academicaffairs/ugcat02-04/>).

Both the non-computer and computer classes emphasized descriptive and inferential statistics. The descriptive statistics taught were frequency distributions, measures of central tendency, measures of variability, graphs, and correlation as a descriptive statistic. The inferential statistics presented were correlation, z-test, t-test, analysis of variance, regression analysis, and the chi-square test. In addition, the lectures emphasized the appropriate rules for using each type of descriptive and inferential statistic.

The non-computer class was a 'traditional' statistics class taught in the fall 2003 semester. Students were expected to perform all required mathematical calculations using a calculator, pencil and paper. A computer was not used in the non-computer class except for the regression analysis lectures. In the regression analysis lectures, students were provided examples of this statistic using Microsoft Excel. The survey instrument was administered to 40 students from this class. The computer classes were taught in the spring 2004 and summer I 2004 semesters with the students performing all required calculations using SPSS version 12.0. The survey instrument was administered to 48 students from these classes.

#### **IV. Results.**

As stated, the goal of this study was to determine whether student's attitudes about statistics would be more favorable for students taught statistics using a computer than students taught statistics using the traditional method. Two statistical processes were used to assess this question. The first was a simple frequency distribution and the second was a Chi-Square Test of Independence ( $X^2$ ) using the Crosstabulation function in SPSS with "computer/non-computer" as the independent variable and the various attitudes as the dependent variable. The overall results indicated a significant difference between the computer and non-computer classes with the computer classes being routinely judged more favorably than the non-computer classes.

##### *A. Selection Bias.*

As noted, one of the problems associated with the ex post facto research design is the chance of selection bias. Two survey questions were asked in an attempt to determine the presence of selection bias. These two questions were question 18: "When registering for this class, how strongly did you want to take it?" and question 19: "Which ONE of the following was the most important reason for taking this class?" The results of these questions indicate there was no selection bias and that the two groups were basically equivalent.

*Question 18: When registering for this class, how strongly did you want to take it?* This question was asked in an attempt to determine whether there was any selection bias attributable to the ex post facto research design. The frequency distribution for Question 18 demonstrates that the students were fairly uniform in their lack of enthusiasm for taking statistics.

**Table 1. Crosstabulation of Class by Q18 (enthusiasm for taking statistics).**

		Q18					Total
		Very enthusiastic	Enthusiastic	Indifferent	Unenthusiastic	Not at all interested	
Class	No Comp	0	8	18	7	7	40
	Computer	4	10	21	10	3	48
Total		4	18	39	17	10	88

The Chi-Square statistic for question 1 was  $\chi^2 = 5.904$  ( $p = 0.206$ ). Accordingly, there was not a significant difference between the students' enthusiasm for taking statistics depending on whether the student was taught in the computer or the non-computer classes.

*Question 19: Which ONE of the following was the most important reason for taking this class?* This question was also asked to try to determine whether there was any selection bias attributable to the ex post facto research design. The frequency distribution for Question 19 indicates that the students were fairly uniform in their reasons for taking this statistics class with a large majority taking it because it was required.

**Table 2. Crosstabulation of Class by Q19 (reasons for taking statistics).**

		Q19					Total	
		Required	Optional	Interested	Instructor	Good Grade		No Response
Class	No Comp	30	3	0	4	1	2	40
	Computer	33	1	3	10	0	1	48
Total		63	4	3	14	1	3	88

The Chi-Square statistic for question 1 was  $\chi^2 = 7.392$  ( $p = 0.194$ ). Accordingly, there was not a significant difference between the students' reason for taking statistics depending on whether the student was taught in the computer or the non-computer classes.

The results of questions 18 and 19 support a finding that there was no selection bias present in the respondents. According to the results of question 18, there was a fairly uniform lack of enthusiasm for taking statistics with no significant difference between the two groups. In addition, the reasons for taking the class were, by a large majority, because the class was required. Again, there was no significant difference between the groups. Students registered for the computer course were no more or less enthusiastic about the course nor were they taking the course for different reasons. As a result, the responses to these questions support an inference that there was little or no selection bias associated with this study, at least in relation to the reasons and motivations for taking the course, whether it be computer focused or not.

*B. General Question Results.*

*Question 1: Learning statistics is mostly memorizing* One of the goals of changing from a traditional to a computer based class was to refocus the students' concentration from memorizing statistical formulas to learning statistical theory and understanding the practical uses of statistics. Question number 1, "learning statistics is mostly memorizing," was intended to determine whether this goal was met. The frequency distribution for Question 1 indicates that

more students in the computer classes either ‘disagreed’ or ‘strongly disagreed’ with this question as compared to the non-computer classes:

**Table 3. Crosstabulation of Class by Q1 (statistics is mostly memorizing).**

		Q1					Total
		Strongly Agree	Agree	Disagree	Strongly disagree	Not Applicable	
Class	No Comp	3	28	8	0	1	40
	Computer	7	18	18	5	0	48
Total		10	46	26	5	1	88

The Chi-Square statistic for question number 1 was  $X^2 = 13.00$  ( $p = 0.0111$ ). Accordingly, there was a significant difference between the students’ attitudes about whether statistics is mostly memorizing, depending on whether the student was taught in a computer or the non-computer class. As a result, it can be concluded that the goal of refocusing the students’ concentration from memorizing statistical formulas to learning statistical theory and understanding the practical uses of statistics was met with the changed way of teaching method.

*Question 2: Statistics is interesting.* A desired by-product of changing from a traditional to a computer based class was to make statistics class more interesting to the average criminal justice student. Question number 2, “statistics is interesting,” was asked to determine whether this occurred. The frequency distribution for Question 2 indicated that more students in the computer classes either ‘strongly agreed’ or ‘agreed’ with this question when compared to the non-computer classes:

**Table 4. Crosstabulation of Class by Q2 (statistics is interesting).**

		Q2					Total
		Strongly Agree	Agree	Disagree	Strongly Disagree	NA	
Class	No Comp	1	15	16	6	2	40
	Computer	8	26	10	3	1	48
Total		9	41	26	9	3	88

The Chi-Square statistic for this question was  $X^2 = 10.473$  ( $p = 0.033$ ). Therefore, there was a significant difference between the students’ attitudes about whether statistics is interesting, depending on whether the student was taught in a computer or the non-computer class. As a result, it can be concluded that the desired byproduct making statistics more interesting to the students was achieved as a result of the change in the teaching method.

*Question 5: Statistics is mostly about symbols and formulas rather than about ideas.* One of the goals of both the non-computer and computer classes was to teach the students when, and under what circumstances, each statistical process should be used. Question number 5, “statistics is mostly about symbols and formulas rather than about ideas,” was asked to determine whether there was a difference in opinions about this question based on whether the student was in a computer or a non-computer class. The frequency distribution for Question 5 shows that students had obvious differences of opinions about the use of statistics depending on whether the student was taught with or without a computer.

**Table 5. Crosstabulation of Class by Q5 (statistics is symbols and formulas vs. ideas).**

		Q5				Total
		Strongly Agree	Agree	Disagree	Strongly disagree	
Class	No Comp	9	24	4	3	40
	Computer	4	12	23	9	48
Total		13	36	27	12	88

The Chi-Square statistic for question 5 was  $\chi^2 = 21.746$  ( $p = 0.000$ ). Therefore, there was a significant difference between the students' opinions about whether statistics is mostly about symbols and formulas rather than about ideas, depending on whether the student was taught in the computer or the non-computer class. Based on this difference, it can be concluded that the goal of teaching the students when and under what circumstances, to use each statistical process was achieved through changing the teaching method.

*Question 6: In statistics, knowing why an answer is correct is important.* A related goal of changing from a traditional to a computer based class was to teach the students to understand the difference between merely solving problems and understanding why the problem was answered in the way in was. Question number 6, "in statistics, knowing why an answer is correct is important," was asked to determine whether the students had a difference of opinion about this question based on whether the student was in a computer or a non-computer class. The frequency distribution for Question 6 indicates that more students in the computer class either strongly agreed or agreed with this question than the students in the non-computer class.

**Table 6. Crosstabulation of Class by Q6 (important to know why an answer is correct).**

		Q6				Total
		Strongly Agree	Agree	Disagree	Strongly disagree	
Class	No Comp	13	19	7	1	40
	Computer	22	24	0	2	48
Total		35	43	7	3	88

The Chi-Square statistic for question 5 was  $\chi^2 = 9.581$  ( $p = 0.022$ ), indicating a significant difference between the responses for this question based on whether the student was taught in the computer or the non-computer classes. Thus, the goal of teaching students to understand the difference between merely solving problems and understanding why an answer is correct was better achieved in the computer class than the non-computer class.

*C. Individual Questions Results.*

*Question 14: My interest in statistics has increased over the semester.* An ever present objective of teaching statistics is keeping the students interested throughout the semester. One hoped-for consequence of changing from a traditional to a computer based class was that the students would stay more interested in the computer based statistics class than in the traditional class. Question number 14, "my interest in statistics has increased over the semester," was asked to determine whether the students' interest in the class increased more throughout the semester in



the computer or non-computer class. The frequency distribution for Question 14 indicates that the students' interest in the computer class increased more throughout the semester than the students in the non-computer class.

**Table 7. Crosstabulation of Class by Q14 (interest increased over the semester).**

		Q14(Interest Increased)					Total
		Strongly Agree	Agree	Disagree	Strongly Disagree	NA	
Class	No Comp	0	18	17	2	3	40
	Computer	7	25	15	0	1	48
Total		7	43	32	2	4	88

The Chi-Square statistic for question 1 was  $X^2 = 10.625$  ( $p = 0.031$ ), indicating a significant difference between the responses for this question based on whether the student was taught in the computer or the non-computer classes. Based on this difference, it can be concluded that the objective of keeping students interested in class was achieved better in the computer than the non-computer class.

*Question 16: Overall, this class was useful to me.* A related goal of keeping the students interested throughout the semester is to teach students that statistics will be useful in the future. With the change to a computer based method of teaching, it was theorized that teaching students how to perform the required calculations on the computer would illustrate the usefulness of statistics since the student would not have to visualize performing calculations with a computer every time a statistic was needed. Question number 16, “overall, this class was useful to me,” was asked to determine whether the computer based statistics class made statistics more useful than the non-computer class. The frequency distribution for Question 16 indicates that the majority of students in the computer class thought statistics were useful when compared to the non-computer class.

**Table 8. Crosstabulation of Class by Q16 (class was useful).**

		Q16					Total
		Strongly Agree	Agree	Disagree	Strongly Disagree	NA	
Class	No Comp	2	27	10	1	0	40
	Computer	12	32	2	1	1	48
Total		14	59	12	2	1	88

The Chi-Square statistic for question 16 was  $X^2 = 13.282$  ( $p = 0.010$ ), indicating a significant difference between the responses for this question based on whether the student was taught in the computer or the non-computer classes. Therefore, it can be concluded that the objective of teaching students that statistics will be useful in the future was achieved better in the computer than the non-computer class.

*Question 25: I would rate the value of this course to me as \_\_\_\_.* Every college class is expensive and students expect to receive something of value from taking a class. Thus, a related goal of teaching students that statistics something useful is to providing the student some value with each class. Question number 25, “I would rate the value of this course to me as,” was asked

to determine whether, in the student’s opinion, about the value of the class was different for the computer and the non computer classes. The computer based statistics class made statistics more useful than the non-computer class. The frequency distribution for Question 25 indicates that more students judged the computer course as excellent and good than did the non-computer class.

**Table 9. Crosstabulation of Class by Q25 (value of the course).**

		Q25				Total
		Excellent	Good	Satisfactory	Poor	
Class	No Comp	8	20	11	1	40
	Computer	22	21	5	0	48
Total		30	41	16	1	88

The Chi-Square statistic for question 25 was  $\chi^2 = 9.156$  ( $p = 0.027$ ), demonstrating a significant difference between the responses for this question based on whether the student was taught in the computer or the non-computer classes. As a result, it can be concluded that students in the class taught with the computer judged the class significantly more valuable than the students in the non-computer class.

**V. Discussion and Conclusion.**

The primary goal of changing the way statistics was taught at Texas State University | San Marcos was to make statistics more ‘user friendly’ and re-focus the students from merely performing the required calculations to understanding statistical theory and the appropriate use of statistical processes. A by-product of this change was to alleviate statistical anxiety by removing the complex mathematical calculations from the class. This study indicates that the goal of alleviating statistical anxiety was met through the change to a computer based class.

The responses to the general attitudinal questions, ‘learning statistics is mostly memorizing,’ ‘statistics is interesting,’ ‘statistics is mostly about symbols and formulas rather than about ideas,’ and ‘in statistics, knowing why an answer is correct is important’ demonstrate a significant difference between the computer and non-computer classes. The differences in opinion highlighted by these questions are important because these questions inquire into one of the primary causes of statistical anxiety – the trepidation resulting from the necessity of performing complex mathematical calculations. These questions illustrate that when the necessity of performing complex mathematical calculations by hand is removed, statistical anxiety decreases.

The responses to the general attitudinal questions are also important because they lend support to the conclusion that using the computer makes statistics more ‘user friendly’ and re-focuses the students from merely performing the required calculations to understanding statistical theory and the appropriate use of statistical processes. As seen, more students understood that statistics is about more than crunching numbers. According to the responses, it appears that the students in the computer classes recognized that statistical processes and theory are as important as being able to perform the required calculations.

The responses to the individual attitudinal questions, ‘my interest in statistics has increased over the semester,’ ‘overall, this class was useful to me,’ and ‘I would rate the value of this course to me as \_\_\_\_\_,’ demonstrate a significant difference between the computer and non-computer classes with regard to individual attitudes about statistics. The differences in opinion highlighted by these questions are important because these questions inquire into how using computers for statistics impacted the individual student. These questions illustrate that removing the requirement to perform the complicated calculations by hand makes the class ‘worth more’ to the individual student. This increased value to the individual student is important because the more that a student receives from a class, the less the anxiety.

This paper reported the results of a survey that inquired whether statistical anxiety was less in classes that used a computer than in classes that did not use a computer. This study found significant differences between the levels of anxiety for computer when compared to non-computer classes. In addition, the findings in this study support the conclusion that students understand that statistical processes and theory are as important as being able to perform the required calculations. In summary, the results support earlier research that found that using computers in teaching statistics helps alleviate statistical anxiety and can improve students’ attitudes towards statistics.

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### Appendix 1. Statistics Course Questionnaire.

1. Learning statistics is mostly memorizing.

Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
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2. Statistics is interesting.

Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
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3. Guessing is “OK” to use in solving statistical problems.

Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
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4. There are rules to follow in solving statistical problems.

Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
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5. Statistics is mostly about symbols and formulas rather than about ideas.

Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
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6. In statistics, knowing why an answer is correct is important.

Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
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7. Statistics are useful in everyday life.

Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
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8. I would like to have a job that includes statistics.

Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
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9. The instructor made class presentations clear.

Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
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10. Statistics class is fun.

Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
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11. The level of difficulty in this class was suitable for my background and ability.

Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
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12. The amount of work required for this class was about right.

Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
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13. I spent a great deal of effort in this class.

Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
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14. My interest in statistics has increased over the semester.

Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
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15. I learned a great deal in this course.

Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
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16. Overall, this class was useful to me.

Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
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17. Are you an:

- A. Undergraduate
- B. Graduate student
- C. Other

18. When registering for this class, how strongly did you want to take it?

- A. Very enthusiastic about it
- B. Enthusiastic
- C. Indifferent
- D. Unenthusiastic
- E. Not at all interested in taking this class

19. Which ONE of the following was the most important reason for taking this class?

- A. The course is required
- B. The course was optional, but recommended
- C. The subject was of interest to me
- D. The instructor's excellent reputation
- E. I thought I could make a good grade

20. What grade did you expect to make?

- A. An 'A'
- B. A 'B'
- C. A 'C'
- D. A 'D'
- E. An 'F'

21. How many credits are you carrying?

- A. more than 16
- B. 13 to 16
- C. 9 to 12
- D. 5 to 8
- E. 0 to 4

22. I would recommend this class to a friend.

Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
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23. My opinion about statistics has changed over the course of this semester.

Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
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24. The work required for this course in relation to other courses was:

Much lighter	Lighter	About the same	Heavier	Much heavier
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25. I would rate the value of this course to me as:

Excellent	Good	Satisfactory	Fair	Poor
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