STUDENTS' ATTITUDES TOWARD STATISTICS: IMPLICATIONS FOR THE FUTURE

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The emergence of a reform movement in statistics education has influenced the teaching and learning of statistics over the past few decades. The teaching of statistics concepts and courses in elementary and secondary education as well as the implementation of technology into the statistics classroom are important changes involved in this movement. Considering the changes in instruction and learning over the past few years, the purpose of this paper was to describe the attitudes of students enrolled in a reformed course. Although previous research has suggested that student attitudes toward statistics have been negative, the overall results suggested that students in introductory statistics courses today have more positive attitudes toward statistics than negative. Important variables related to statistics achievement such as mathematics ability, statistics experience, student confidence, and gender continue to influence student attitudes. Implications from the findings of this study might suggest that the collaborative effort from researchers and teachers to improve the teaching and learning of statistics over the past few years reveals optimistic results.

Introduction

The teaching and learning of statistics has impacted the curriculum in every level of education. The NCTM Principles and Standards (NCTM, 2000) includes a content standard that emphasizes statistical reasoning for Pre-K through grade 12 and as a result, many states now include and emphasize statistical thinking in their statewide curriculum guidelines. Student enrollments in AP statistics courses are increasing each year and there are many ASA-sponsored programs and workshops to support K-12 teachers and administrators (i.e., BAPS, Adopt-A-School). In post-secondary education, almost every student is required to take a statistics course, regardless of their major. The ability to develop statistical thinking and reasoning skills is fast-becoming an important objective.

Over the past few years, there has been a shift on how to teach statistics, to students of different ages as well as in a variety of different fields. In 1992, the American Statistical Association (ASA) and the Mathematical Association of America (MAA) formed a joint committee to study the teaching of introductory statistics. The main recommendations were to emphasize statistical thinking, incorporate data and emphasize concepts using less theory and fewer 'recipes', and to foster active learning (Cobb, 1992). In more recent years, a movement to reform the teaching of statistics calls for researchers and teachers to focus on the synergy between content, pedagogy, and technology (Moore, 1997). Not only should students be active participants assigned with structured activities that focus on statistical concepts and ideas that are nonmathematical in nature, but content and pedagogy should be strongly influenced by technology (Moore, 1997).

Technology has changed statistics learning and instruction. According to Moore (1997), using technology in statistics instruction should help to automate many routine operations and as a result, facilitate conceptual learning. In addition, with the use and aid of technology, students can actively explore the meaning of statistical concepts through the use of computer simulation methods (CSMs). (Dambolena, 1986; Gordon & Gordon, 1989; Hesterberg, 1998; Kalsbeek, 1996; Kersten, 1983; Shibli, 1990). By using current computing technology, it is possible to supplement standard data analysis assignments by providing students with additional statistical experiences. Computer simulations are invaluable in this regard because abstract or hard to understand concepts can be illustrated visually using many standard programs (i.e., Excel, Minitab). This may enhance the learning experience, especially for students in introductory statistics courses.

Considering the changes in statistics learning and instruction, important questions related to student attitudes are of interest. Student attitudes about statistics are important because they may influence the learning process. In particular, student attitudes and beliefs about statistics can affect the extent to which students will develop useful statistical thinking skills, whether they will apply what they have learned outside of the classroom, and whether or not students will choose to enroll in further statistics courses (Gal, Ginsburg, & Schau, 1997). Negative student attitudes toward statistics may create a major obstacle for effective learning (Cashin & Elmore, 1997; Fullerton & Umphrey, 2001; Schutz, Drogsz, White, & Distefano, 1998; Waters, Matelli, Zakrajsek, & Popovich, 1988).

Many efforts have been made to investigate affective factors that affect a student's statistical performance. Much of the research involves surveys designed to quantify student attitudes (Statistics Attitude Survey (Roberts & Bilderback, 1980); Attitude Toward Statistics Scale (Wise, 1985); Statistics Attitude Scale (McCall, Belli, & Madjidi, 1990); Multifactorial Scale of Attitudes Toward Statistics (Auzmendi, 1991); Survey of Attitudes Toward Statistics (Schau, Dauphinee, & Del Vecchio, 1993) or characterize how anxiety influences performance (Revised Mathematics Anxiety Rating Scale (Plake & Parker, 1982); Statistical Anxiety Rating Scale (Cruise, Cash, & Bolton, 1985); Statistics Anxiety Inventory (Zeidner, 1991). According to Hopkins, Hopkins, and Glass (1996), previous research findings suggest that popular student attitudes toward statistics include anxiety, cynicism, fear, and contempt.

In previous studies, many variables related to student attitudes such as previous mathematics grades, self-concept, prior computer experience, grade point average, previous statistics experience, level of statistics course (introductory vs. advanced), anxiety, and gender have been investigated. Results have shown that attitudes are related to math experience (Brown & Brown, 1995), level of statistics course (Waters, Martelli, Zakrajsek, & Popovich, 1989), previous statistics experience

(Sutarso, 1992), and grade point average (Ware & Chastain, 1989). In addition, research regarding anxiety has indicated a negative relationship; that is, the higher a student's anxiety level, the lower the student's performance (Benson, 1989; Ware & Chastain, 1989). Many other researchers have explored whether gender differences are related to student attitudes or cognitive performance, with somewhat mixed results (Elmore & Vasu, 1986; Faghihi & Rakow, 1995; Fullerton & Umphrey, 2001; Roberts & Saxe, 1982; Sutarso, 1992; Ware & Chastain, 1989; Waters et al., 1989; Woehlke & Leitner, 1980). Finally, innovative teaching and learning strategies have also been used to improve student attitudes, such as utilizing technology in the classroom or using hands-on constructivist-type activities. Results for these studies have shown no changes in student attitudes toward statistics (Brandsma, 2000; High, 1998) to some changes in certain aspects of statistics (Kennedy & McCallister, 2001).

Purpose

Over the past few years, there has been a concerted effort to improve the teaching and learning of statistics. The matriculation of the computer and other uses of technology in the statistics classroom as well as new and innovative teaching strategies continue to offer teachers (and students) with many teaching (and learning) alternatives. Students enrolled in an introductory undergraduate statistics course that emphasized concepts and incorporating technology (i.e., data analysis, CSMs) were administered the Survey of Attitudes Toward Statistics (SATS). This survey was used to simply describe student attitudes toward statistics as well as to provide additional research regarding important variables related to student attitudes.

Method

The SATS uses a 7-point Likert scale (1 = strongly disagree, 4 = neither disagree nor agree, 7 = strongly agree) that contains 4 subscales: 1) Affect, 2) Cognitive Competence, 3) Value, and 4) Difficulty. Higher scores indicate more positive attitudes toward statistics. Items such as 'I like statistics', 'I am under stress during statistics class', 'Statistics is worthless', and ' Most people have to learn a new way of thinking to do statistics' are example attitudinal statements from each subscale, respectively (the SATS is appended). The SATS survey was chosen because the subscales on the survey represent important attitudes that are related to student achievement (Elmore, Lewis, & Bay, 1993; Schau et al., 1993). Also, this survey has been used in previous research and its reliability and validity indices have been empirically documented and are reported below.

Schau, Stevens, Dauphinee, and Del Vecchio (1995) reported reliability and validity indices for the SATS. The range of coefficient alphas by subscale was for 1403 students enrolled in an introductory statistics course at the University of Mexico and the University of South Dakota in 1995. The following coefficients have been reported:

SATS Affect:	.81-.85
SATS Cognitive Competence:	.77-.83
SATS Value:	.80-.85
SATS Difficulty:	.64-.77

A confirmatory factor analysis was used to assess the construct validity for a four-factor model. All of the SATS items loaded significantly on their hypothesized factor and goodness-of-fit indices revealed that the hypothesized structured provided a good model fit [(Adjusted Goodness of fit index (AGFI) = .97, Root Mean Square Error of Approximation (RMSE) = .03, Tucker Lewis Index (TLI) = .98)]. In addition, maximum likelihood parameter estimates indicated that each parcel (item) loaded strongly and significantly on its hypothesized factor.

Participants

The participants were 203 undergraduates enrolled in an introductory undergraduate statistics course at a large southeastern university in the College of Business during the spring semester 2000. The majority of the participants were male (55.7%) and European American (82.2%). In addition, 89.1% reported that they were pursuing a Bachelor's degree. Over 48% of the participants reported that their grade point average was between 3.0-3.5 (48.5%) and the majority of the participants (66.8%) indicated that they have never taken a statistic course before.

Participants volunteered during the first few weeks of class to participate in a study related to learning statistics. Students were allowed to earn extra credit for their participation. The students signed informed consent forms and were invited to review the final results of the study.

Data Analysis

Student attitudes were investigated considering descriptive statistics: means, standard deviations, modes, and correlations. In addition, categorical data methods were also utilized to compare males versus females on important variables that have been previously shown to be related to student attitudes. A brief overview of the categorical models used to describe student attitudes and the results, discussion, and conclusion concludes the paper.

Categorical Data Analysis

Categorical data analysis is a sophisticated method for analyzing categorical data and has been widely used for applications in biomedical and social science research. The application of these methods in education research can offer researchers newer statistical methodologies to assist in answering research questions for categorical data, especially since methods for continuous data may be inappropriate. Categorical data methods using logit models were used for two-way contingency tables. In particular, the cumulative logit proportional odds model was fit to the data, when appropriate.

In the proportional odds model, the cumulative logits can be modeled and the odds of a response below any given category can be estimated. For a predictor x, the model is

$$\text{Logit}[(P(Y < j)] = \alpha j + \beta x,$$

where $j = 1 \ldots. J - 1$ and the parameter β describe the effect of x on the log odds of response in category j or below. The cumulative probabilities are the probabilities that the response Y falls in category j or below, for each possible j . For a 2 group scenario, the model fits well when subjects in one group tend to make higher responses on the ordinal scale than subjects in the other group (Agresti, 1996).

Local odds ratios for pairings of categories were used to describe the model, when appropriate. Local ratios use adjacent rows and columns. For the 2 X 2 table using cells intersecting rows a and c with columns b and d, the model has odds ratio equal to

$$\mu ab\ \mu cd / \mu ad\ \mu cb = \exp[\beta(u_c - u_a)(v_d - v_b),$$

where the row and column numbers were the scores assigned.

Results

For this study, Cronbach coefficient alpha reliability estimates were generated by subscale. For the affect subscale consisting of 6 items, the coefficient alpha was .85 (n = 201). The coefficient reliability estimates for the cognitive competence (6 items), value (8 items), and difficulty (7 items) scales were .80 (n = 203), .88 (n = 202), and .71 (n = 202), respectively. The four subscales provided acceptable reliability estimates.

Tables 1-3 present the descriptive statistics by subscale for the SATS (please see the Appendix for a copy). In Table 1, items 1, 2, 10, 13, 14, and 20 measured affect while items 3, 8, 19, 22, 23, and 26 comprised the cognitive competence subscale. The value subscale was measured by items 5, 7, 9, 11, 12, 15, 18, and 24 and items 4, 6, 16, 17, 21, 25, and 27 measured difficulty.

For the affect subscale, the mode response of 4 indicated that student attitudes were neutral toward affect. An investigation of modal responses for items on this subscale revealed that students both agreed and disagreed with statements from this subscale. For example, students agreed to the statement 'I like statistics' (mode = 5) but they disagreed that they enjoyed taking statistics courses (mode = 3) and agreed that they get frustrated over statistics tests in class (mode = 5). Students also disagreed to the statement 'I feel insecure when I have to do statistics problems' (mode = 3) and they strongly disagreed that they were scared by statistics (mode = 1).

An overall sentiment of disagreement (mode = 2) described the student attitudes for the cognitive competence scale. Although students strongly agreed that they can learn statistics (mode = 7) and agreed that they can understand statistics equations (mode = 5), they disagreed that they have trouble understanding statistics because of the way they think (mode = 2), that they make a lot of math errors (mode = 2), and they strongly disagreed that they have no idea what's going on in statistics (mode = 1). They also disagreed that they find it difficult to understand statistics concepts (mode = 3).

The typical sentiment for the items on the value subscale was also disagreement (mode = 2). Students disagreed that statistics is worthless (mode = 1), statistical thinking is not applicable outside of their job (mode = 2), statistics is not useful to the typical profession (mode = 2), statistics is not applicable in their profession (mode = 2), statistics conclusions are rarely presented in everyday life (mode = 3), and statistics is irrelevant in one's life (mode = 3). Students agreed that statistics should be

Table 1
Descriptives by Question

Question	mode	mean	s.d.	Question	mode	mean	s.d.
1- like statistics	5.00	4.03	1.61	19-make math errors	2.00	3.68	1.72
2-feel insecure	3.00	3.79	1.69	20-scared by statistics	1.00	3.48	1.90
3-trouble understanding	2.00	3.38	1.70	21-massive computations	3.00	3.98	1.50
4-formulas easy	5.00	3.98	1.60	22-can learn statistics	7.00	6.00	1.08
5-statistics is worthless	1.00	2.22	1.46	23-understand equations	5.00	4.65	1.41
6-statistics is complicated	6.00	5.45	1.47	24-irrevelant in my life	3.00	2.95	1.52
7-should be required	5.00	4.37	1.61	25-highly technical	5.00	4.49	1.34
8-no idea what's going on	1.00	2.62	1.53	26-difficult to understand	3.00	3.74	1.68
9-not useful	2.00	2.98	1.67	27-new way of thinking	4.00	4.15	1.44
10-get frustrated over tests	5.00	3.82	1.86	28-confident you can master	5.00	5.01	1.44
11-not applicable in my life	2.00	3.10	1.59	29-males and females skills	4.00	4.44	1.13
12-I use statistics	5.00	3.90	1.73	30-what grade expect	4.00	3.69	1.90
13-under stress in class	5.00	4.19	1.78	31-how well in H.S. math	7.00	5.72	1.41
14-enjoy taking statistics	3.00	3.25	1.67	32-how good at math	5.00	5.23	1.28
15-conclusions rarely	3.00	2.88	1.53	33-computer experience	5.00	5.28	1.27
16-statistics quickly learned	2.00	2.28	1.30	34-statistics experience	1.00	2.70	1.60
17-requires discipline	6.00	5.27	1.47	35-use statistics in field	4.00	4.18	1.43
18-no application in job	2.00	2.82	1.49				

Table 2
Mode by Subscale

Subscale	Mode
Affect	4.00
Cognitive Competence	2.00
Value	2.00
Difficulty	5.50*

* The difficulty subscale was bimodal with scores 5 and 6 occurring the most.

required as a part of their professional training (mode = 5) and that they use statistics in their everyday lives (mode = 5).

Finally, students primarily agreed with the statements on the difficulty subscale (mode = 5.5). On the one hand, students agreed that statistics is a complicated subject (mode = 6), that it requires a great deal of discipline (mode =6), and that statistics is highly technical (mode = 5), but on the other hand, they also agreed that statistics formulas are easy to understand (mode = 5). As far as disagreement for this subscale, students disagreed that statistics is a subject quickly learned by most people (mode = 2), and that it involves massive computations (mode = 3).

Table 3 presents the Spearman correlations between select items from the survey. Results for important variables that have been studied in previous research are considered. In particular, the relationship between items 28 (confidence), 32 (mathematics skill), and 34 (statistics experience) with items 1 (like statistics), 4 (formulas easy), 5 (statistics is worthless), 7 (statistics should be required), 20 (scared by statistics), 22 (can learn statistics), 26 (difficult to understand), and 27 (new way of thinking to do statistics) are discussed. In addition, beta weights, asymptotic standard errors, and odds ratios are reported from the logit model to further describe important variables related to gender in Table 4. The relationship between item 36 (gender) with items 1 (like statistics), 20 (scared by statistics), 22 (can learn statistics), and 28 (confidence) are considered. A discussion of the results linked back to previous research and the conclusion ends the paper.

Table 3
Spearman Correlation Matrix for Select Variables

Item	Confidence	Math	Statistics
1-like statistics	.41*	.32*	.27*
4-formulas easy	.34*	.16*	.16*
5-statistics is worthless	-.26*	-.06	-.02
7-should be required	.12	.04	.04
20-scared by statistics	-.52*	-.39*	-.33*
22-can learn statistics	.52*	.27*	.18*
26-difficult to understand	-.57*	-.35*	-.36*
27-new way of thinking	-.22*	-.01	-.08

* $p \leq .05$

How confident are you that you can master introductory statistics material?

Students who felt confident about mastering statistics material also agreed that they can learn statistics ($r = .52, p < .0001$), they like statistics ($r = .41, p < .0001$), and statistics formulas are easy to understand ($r = .34, p < .0001$). They disagreed that they are scared by statistics ($r = -.52, p < .0001$), that it is difficult to understand statistics concepts ($r = -.57, p < .0001$), that statistics is worthless ($r = -.26, p = .0004$), and that people have to learn a new way of thinking to do statistics ($r = -.22, p = .0018$). Although the latter relationship may be considered weak, the other items appear to be moderately correlated.

How good at mathematics are you?

Students who reported that they were good in mathematics also reported to like statistics ($r = .32, p < .0001$), that they can learn statistics ($r = .27, p = .0002$), and they also agreed that statistics formulas are easy to understand ($r = .16, p =.0305$). There was a moderate and negative association between students who reported being good in mathematics and the statement ' I am scared by statistics' ($r = -.39, p < .0001$) and the statement 'I find it difficult to understand statistics concepts' ($r = -.35, p < .0001$).

How much experience with statistics (e.g., courses, research studies) did you have BEFORE taking this course?

Students who reported experience with statistics also reported that they like statistics ($r = .27, p = .0002$), that statistics formulas are easy to understand ($r = .16, p = .0271$), and that they can learn statistics ($r =.18, p =.0137$). These items appear to be weak to moderately correlated. Also, students with statistics experience also disagreed that they are scared by statistics ($r = -.33, p < .0001$) and that statistic concepts are difficult to understand ($r = -.36, p < .0001$).

What is your sex?

Table 4 presents the statistics from the proportional odds model (G^2_p) which was used to approximate the fit to the data for gender and items 1 (like statistics), 20 (scared by statistics), 22 (can learn statistics), and 28 (confidence). The proportional odds model provided adequate fit for all items (item 1: $G^2_p = 5.4$, df = 5, $p = .367$; item 20: $G^2_p = 11.0$, df = 5, $p = .0507$; item 22: $G^2_p = 2.5$, df = 4, $p = .653$; and item 28: $G^2_p = 8.4$, df = 5, $p = .136$).

Table 4
Beta Weights, Odds Ratios

Gender by Item	β	ASE	θ
1	-.445	.252	-
20	.954	.249	2.60
22	-.106	.269	2.85
28	-.947	.260	2.56

The ordinal test of independence was not statistically significant for item 1, indicating no difference in males and females on whether students like statistics (G^2 (LR) = 3.2, $p = .075$). However, there were statistically significant associations for items 20 (scared by statistics - G^2 (LR) = 14.6, $p < .0001$), 22 (can learn statistics - G^2 (LR) = 15.8, $p < .0001$), and 28 (confidence - G^2 (LR) = 13.7, $p < .0001$). The estimated odds that males disagree to the statement 'I am scared by statistics' rather than agree was 2.6 times the estimated odds for females. In other words, males were 2.6 times more likely to agree that they are not scared of statistics than females. In addition, males were 2.85 times more likely to agree that they can learn statistics than females and 2.56 times more likely to report that they are confident that they can master introductory statistics material than females.

Discussion

Results from this study reveal that students have more positive attitudes about statistics than negative, a finding that coincides with some previous research (Kennedy & McCallister, 2001; Perney & Ravid, 1990; Waters et al., 1989). In particular, students in this study agreed that: 1) they like statistics, 2) they can learn statistics, 3) they can understand statistics equations, 4) statistics should be a part of their training, and 5) they use statistics in everyday life. Furthermore, they disagreed that: 1) they feel insecure when solving statistics problems, 2) they are scared by statistics, 3) they have trouble understanding statistics because of the way they think, 4) they make a lot of math errors, 5) they have no idea what's going on in statistics, 6) they find it difficult to understand statistics concepts, 6) statistics is worthless, 7) statistical thinking is not applicable in their profession, 3) statistics conclusions are rarely presented in everyday life, 8) statistics is irrelevant in one's life, and 9) statistics involves massive computations. As far as statements that might imply less than positive attitudes, students agreed that they get frustrated over statistics tests in class, that statistics is a complicated subject, that it requires a great deal of discipline, that it is highly technical, and that it is not a subject quickly learned by most people.

Research reported by Perney and Ravid (1990) found that students having more mathematics experiences had more positive attitudes toward statistics than students with less experience, a finding also supported by Brown and Brown (1995) as well as the results of this study. Sutarso (1992) found no relationship between a student's mathematics background and student attitudes using the Students' Attitudes Toward Statistics (STATS); however, a positive relationship was observed for those students with some statistics 'pre-knowledge'. The results from this study also revealed that students with statistics experience were more likely to have more positive attitudes. Finally, previous research by Fullerton & Umphrey (2001) indicated no relationship between student attitudes and confidence in statistics, a finding that conflicts the results for this variable. This study found that students who felt confident that they could master introductory statistics material also had very positive attitudes about statistics.

An examination of the cross tabulations of the gender variable provided the most interesting results. It was determined that males were more likely than females to report that they were not scared of statistics, that they can learn statistics, and they felt confident mastering statistics material. Similar results about females' negative attitudes have been discussed (Fullerton & Umphrey, 2001; Ware & Chastain, 1989) but others have reported no differences in males and females (Faghihi & Rakow, 1995; Sutarso, 1992; Waters et al., 1989). The results of this study reveal that further attention may need to be devoted to improving female attitudes about statistics particularly if their academic performance also suffers, a result found by Ware and Chastain (1989).

Finally, there could be many reasons why the students in this study revealed more positive attitudes about statistics than negative. Some of these reasons could be directly related to the statistics reform movement. First, the teaching of statistics has affected every level of education. With statistics concepts being introduced as early as the elementary level, students are less likely to dislike and not understand statistics. Second, many 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.

Conclusion

The reform movement to improve the teaching and learning of statistics has influenced how we teach statistics. As a result, there continues to be a need for research about student attitudes about statistics. Perhaps student attitudes have been negative in the past (Cashin & Elmore, 1997; Fullerton & Umphrey, 2001; Hopkins et al., 1996; Schutz et al., 1998; Waters et al., 1988), but the evidence in this study indicates that students are now experiencing more positive attitudes toward statistics than negative attitudes. Furthermore, important variables related to statistics achievement such as mathematics ability, statistics experience, confidence, and even gender continue to influence student attitudes. Perhaps the many changes related to the teaching and learning of statistics is making a positive impact on attitudes. With these results in mind, there is clearly much research ahead to pursue, but there is some evidence that we are progressing in the right direction.

Appendix

Survey of Attitudes Toward Statistics (SATS)

1. I like statistics (affect)
2. I feel insecure when I have to do statistics problems (affect)
3. I have trouble understanding statistics because of how I think (cognitive competence)
4. Statistics formulas are easy to understand. (difficulty)
5. Statistics is worthless. (value)
6. Statistics is a complicated subject. (difficulty)
7. Statistics should be a required part of my professional training. (value)
8. I have no idea of what's going on in statistics. (cognitive competence)
9. Statistics is not useful to the typical professional. (value)
10. I get frustrated going over statistics tests in class. (affect)
11. Statistical thinking is not applicable in my life outside my job. (value)
12. I use statistics in my everyday life. (value)
13. I am under stress during statistics class. (affect)
14. I enjoy taking statistics courses. (affect)
15. Statistics conclusions are rarely presented in everyday life. (value)
16. Statistics is a subject quickly learned by most people. (difficulty)
17. Learning statistics requires a great deal of discipline. (difficulty)
18. I will have no application for statistics in my profession. (value)
19. I make a lot of math errors in statistics. (cognitive competence)
20. I am scared by statistics (affect)
21. Statistics involves massive computations (difficulty)
22. I can learn statistics (cognitive competence)
23. I understand statistics equations. (cognitive competence)
24. Statistics is irrelevant in my life. (value)
25. Statistics is highly technical. (difficulty)
26. I find it difficult to understand statistics concepts. (cognitive competence)
27. Most people have to learn a new way of thinking to do statistics. (difficulty)
28. How confident are you that you can master introductory statistics material?
29. In general, how do you compare females' and males' skills in statistics?
30. What grade do you expect to receive in your statistics course?
31. How well did you do in your high school mathematics courses?
32. How good at mathematics are you?
33. How much computer experience did you have BEFORE taking this course?
34. How much experience with statistics (e.g., courses, research studies) did you have BEFORE taking this course?
35. In the field in which you hope to be employed when you finish school, how much will you use statistics?

3.What is your sex? (male or female)

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