STUDENTS ATTITUDES TOWARD LEARNING STATISTICS WITH TECHNOLOGY

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Introduction

❖Many researchers described innovative ways computers are being used in undergraduate and graduate statistics courses and their impact on the way these courses are being taught (Biehler, 1993; Moore, 1997; Ben-Zvi, 2000; Callingham, 2010).

❖Statistics education community pays attention to the impact that technology may have on the learning statistics (Chance et all., 2007).

❖ Majority of the published studies are related to measuring students' attitude to learning mathematics with technology and there is little published about the student's attitude toward learning undergraduate statistical courses with statistical software, especially for institutions serving large Hispanic population.

Objectives

❖ The objective of the current research is to determine students' attitude towards learning undergraduate statistics with technology, using survey data collected at UTRGV in Spring 2020.

Methods

Data set

- ❖ Cross-sectional design to collect data at undergraduate level statistical courses taught at UTRGV Edinburg and Brownsville campuses during Spring 2020.
- ❖ This research has been reviewed and approved by the Institutional Review Board for Human Subjects Protection (IRB), IRB#19-0534.

Survey format

- ❖ Assessed socio-demographic and basic students' academic information
- ❖ Used two developed survey tools: (Hsu, M.K., et al., 2000, Anastasiadou, S.D, 2011) Majority of the survey questions were measured in five-point Likert scale (strongly agree, agree, neutral, disagree, strongly disagree).
- ❖ The survey scales demonstrated good internal consistency (all **Cronbach alpha** were greater than the threshold of 0.70) on the collected data (Nunnally, 1994).

Analysis

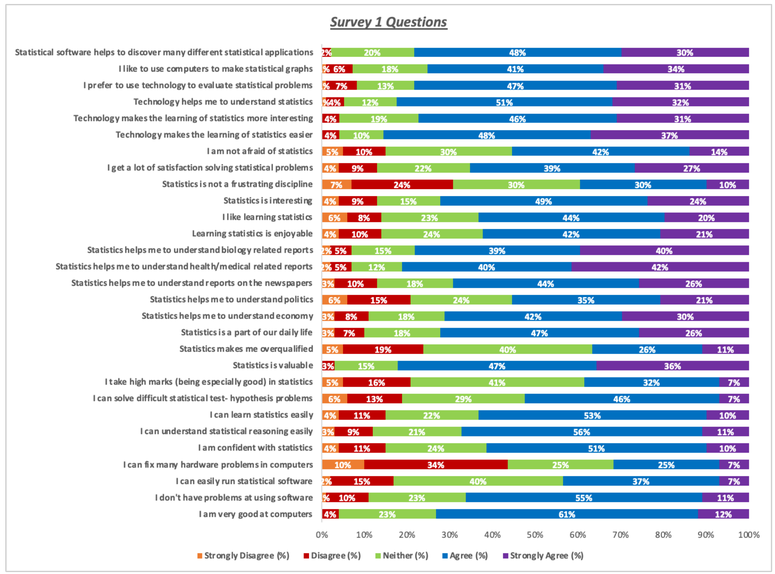
- ❖ Descriptive statistics analyses (frequencies and percentages for categorical variables and means and standard deviations for continuous variables).
- ❖ Proportional Odds Regression models used to estimate odds ratios (ORs) for lower versus higher response levels for various Likert scale variables and their respective 95% confidence intervals
- ❖ Score Test was used to evaluate assumptions
- ❖ All statistical tests were 2-sided and performed at 0.05 significance level.
- ❖ SAS software version 9.4.

Results

Table 1. Descriptive statistics of the student's sample

Categorical Variables	No (%)
Gender (n=95)	
Male	29 (30.53)
Female	66 (69.47)
Health insurance status (n=92)	
No	51 (54.26)
Yes	43 (45.74)
Annual household income (n=92)	
<20,000	43 (46.74)
>= 20,000	49 (53.26)
Course (n=107)	
Lower undegraduate level	69 (64.49)
Upper undergraudate level	38 (35.51)
Campus (n=107)	
UTRGV-Brownsville	49 (45.71)
UTRGV-Edinburg	58 (54.21)
College (n=107)	
COS, Engeneering and computer science	41 (38.32)
Other	66 (61.68)
Statistical software used in class (n=107)	
Statistical software used	44 (41.12)
no software used	63 (58.88)
Role at university (n=95)	
Graduate Student	2 (2.11)
Student- Freshman	22 (23.16)
Student- Junior	20 (21.05)
Student- Senior	29 (30.53)
Student- Sophomore	22 (23.16)
Highest level of education (n=95)	
Highschool or below	62 (65.26)
Undergraduate and above	33 (34.74)
Have you taken any statistical course before? (n=95)	
Yes	55 (57.89)
No	40 (42.11)
Instructor (n=96)	
PHD	67 (69.79)
MS	29 (30.31)

Figure 1. Survey responses to questions from Survey tool #1 (Hsu, M.K., et al., 2000)



Results (cont.)

Table 2. Findings from proportional odds regression analysis of various attitudes

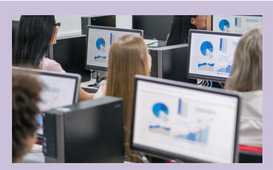
Characteristic	OR (95% CI)	P-value
Using statistical software can make it easier to do my job		
Income <$20,000 vs. >$20,000	2.29 (1.06, 4.95)	0.036
Lower undegraduate level vs upper undergraduate level	0.24 (0.11, 0.53)	0.0005
Statistical software vs no software used	2.96 (1.37, 6.4)	0.0059
High School or below vs undergraduate and above	2.93 (1.31, 6.55)	0.0091
Have taken any statistical course before vs haven't taken any	2.38 (1.1, 5.15)	0.0271
Using a statistical software in my job can increase my productivity		
Income <$20,000 vs. >$20,000	3.19 (1.46, 6.96)	0.0036
Lower undegraduate level vs upper undergraduate level	0.23 (0.1, 0.51)	0.0003
Statistical software vs no software used	3.85 (1.77, 8.38)	0.0007
Have taken any statistical course before vs haven't taken any	2.62 (1.22, 5.62)	0.0131
I find statistical software useful in my job		
Income <$20,000 vs. >$20,000	2.69 (1.25, 5.78)	0.0115
Lower undegraduate level vs upper undergraduate level	0.28 (0.13, 0.62)	0.0015
Statistical software vs no software used	3.11 (1.45, 6.64)	0.0035
Have taken any statistical course before vs haven't taken any	3.03 (1.41, 6.54)	0.0046

Characteristic	OR (95% CI)	P-value
Using a statistical software would enable me to accomplish statistical analysis more quickly		
Lower undegraduate level vs upper undergraduate level	0.25 (0.11, 0.57)	0.0011
Statistical software vs no software used	3.79 (1.69, 8.47)	0.0012
Using a statistical software can improve my job performance		
Lower undegraduate level vs upper undergraduate level	0.19 (0.08, 0.45)	0.0001
Statistical software vs no software used	3.65 (1.66, 8.01)	0.0013
Have taken any statistical course before vs haven't taken any	2.5 (1.16, 5.41)	0.02
I find it easy to get a statistical software to do what I want it to do		
Income <$20,000 vs. >$20,000	2.54 (1.16, 5.57)	0.0195
Lower undegraduate level vs upper undergraduate level	0.33 (0.15, 0.73)	0.0062
Statistical software vs no software used	2.35 (1.1, 5.04)	0.0281
My interaction with statistical software is understandable and clear		
Income <$20,000 vs. >$20,000	3.11 (1.39, 6.99)	0.006
Lower undegraduate level vs upper undergraduate level	0.32 (0.14, 0.71)	0.0052
Statistical software vs no software used	2.53 (1.17, 5.5)	0.0188
I find statistical software to be flexible to interact with		
Income <$20,000 vs. >$20,000	3.13 (1.39, 7.04)	0.0058
Have taken any statistical course before vs haven't taken any	2.87 (1.3, 6.32)	0.0091

- ❖ A total of 107 students answered the post-survey questions.
- ❖ The mean age of the students was 21.3 ±4.3 years and 69.5% of them were females.
- ❖ Nearly half of the students had less than $20,000 family annual income and had no health insurance.
- ❖ Only 41.1% of the surveyed students used statistical software such as SAS, R or STATA during the semester.
- ❖ Students who used statistical software in their classes had **2.34 (95%CI: 1.10, 4.97)** times higher odds of answering higher vs. lower responses on the question "**I can solve difficult statistical test- hypothesis problems**";
- ❖ **2.83 (95% CI: 1.28, 6.26)** times higher odds of answering higher vs. lower responses on the question "**Technology makes the learning of statistics easier",**
- ❖ **4.88 (95% CI: 2.13, 11.18)** times higher odds of answering higher vs. lower responses on the question "**Technology makes the learning of statistics more interesting**";
- ❖ **3.5 (95% CI: 1.57, 7.87)** times higher odds of answering higher vs. lower responses on the question "**Technology helps me to understand statistics**";
- ❖ **4.42 (95% CI: 1.94, 10.09)** - on the question "**Statistical software helps to discover many different statistical applications";**
- ❖ **3.59 (95% CI: 1.67, 7.73)-** on the questions **" Learning statistics is enjoyable" and "I like learning statistics".**

Discussion and Conclusions

- ❖ Our initial findings indicate that the use of statistical software such as SAS, R, and STATA in teaching undergraduate level statistical classes has a positive impact on students' attitudes towards statistics as a subject, learning statistics, and use statistics to solve problems.
- ❖ Use of statistics software makes learning statistics more enjoyable and interesting.
- ❖ Data show that lower income students have higher odds of enjoying learning statistics with software but at the same time lower odds of being good at computers, indicating that may be low-income families do not have computer access at home.
- ❖ This is an ongoing study and currently we are fitting regression models and conducting paired data analysis for pre- and post-surveys.



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