An Innovative Project-Based Learning Approach to Engage Undergraduate Students in Research

Shyam Nair, Danhong Chen, Foy D. Mills, and L. A. Wolfskill

Department of Agricultural Sciences
Sam Houston State University

2018 North American Colleges and Teachers of Agriculture Conference
Iowa State University, Ames, Iowa, June 12-15, 2018

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Acknowledgements

Travel Support: USDA-NIFA NLGCA Grant

"Integrating agricultural remote sensing , landscape flux measurements, and agroecosystem modeling in agricultural research and teaching."

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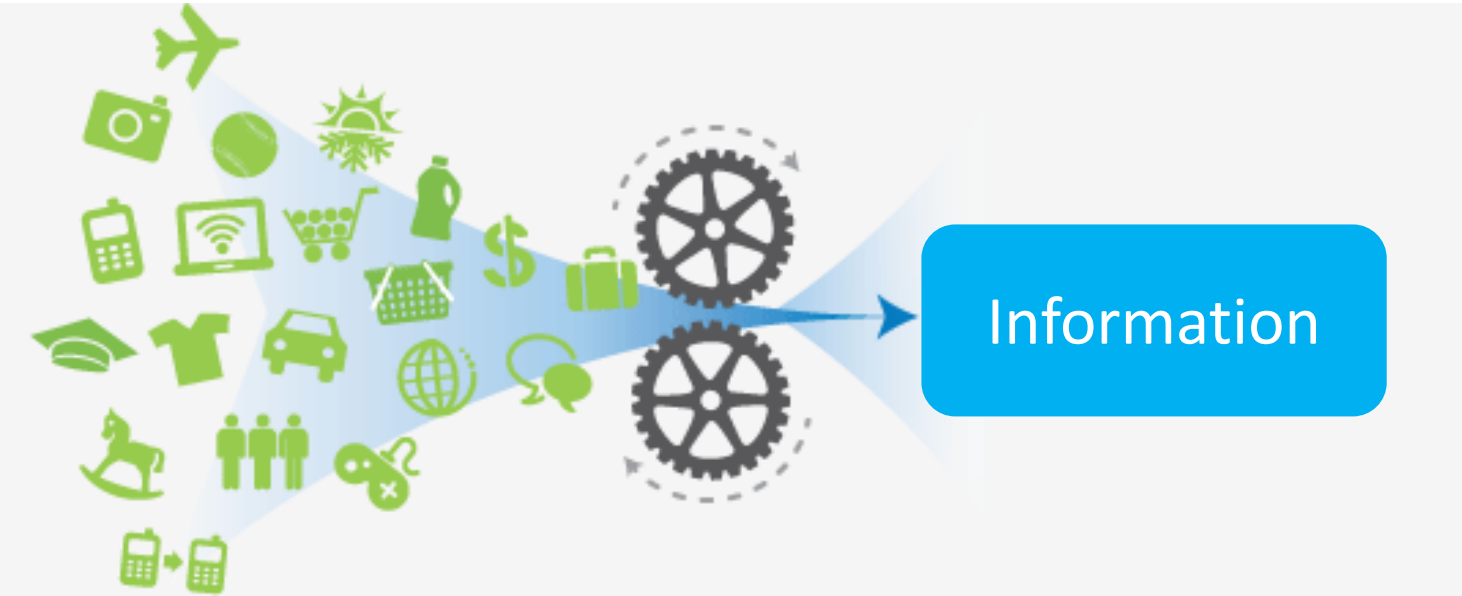
Introduction: AGBU 3385

Course Theme: Make sense of data

Use information derived from data for decision making



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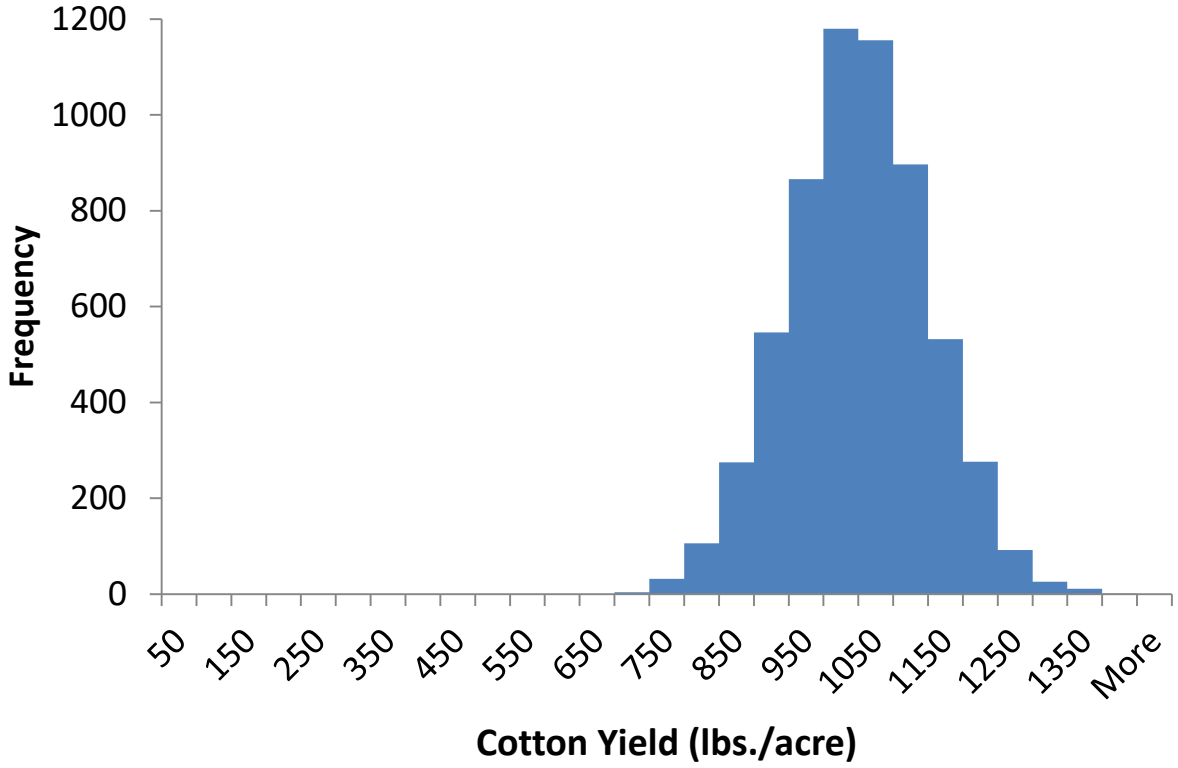
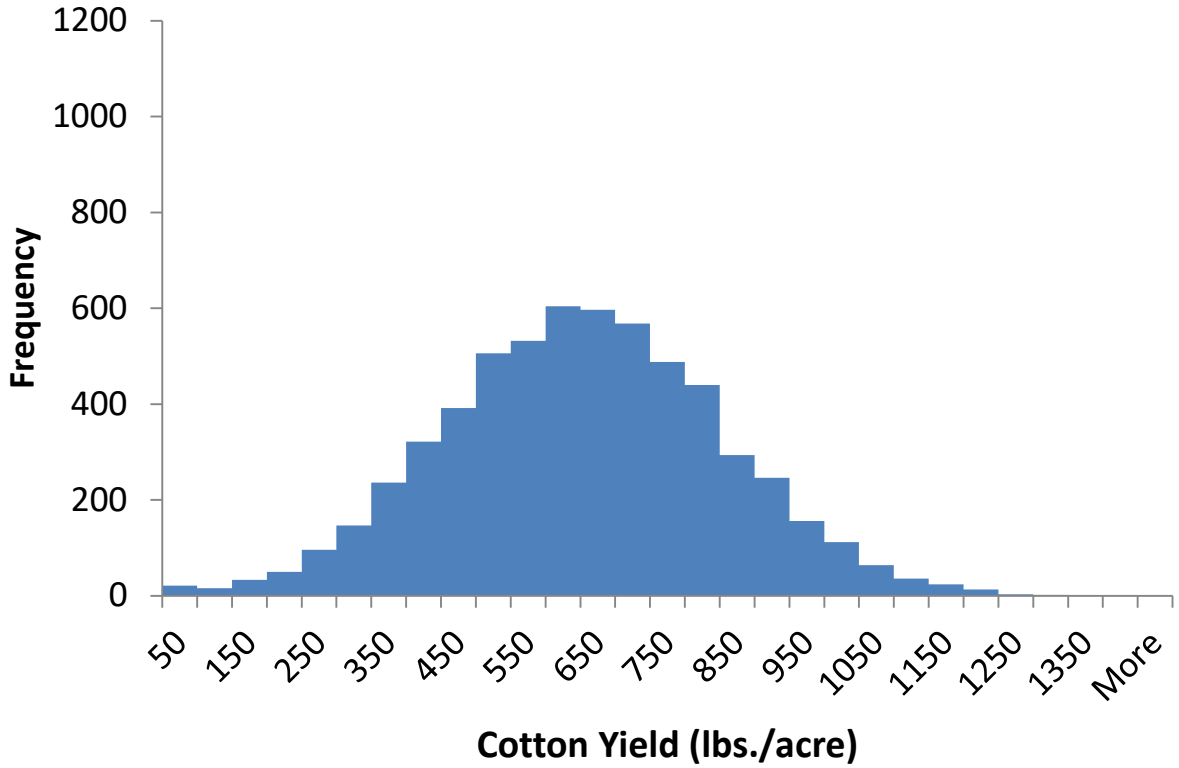
Introduction: AGBU 3385

Simplified datasets are used for deeper understanding

Eg: Central tendency and dispersion

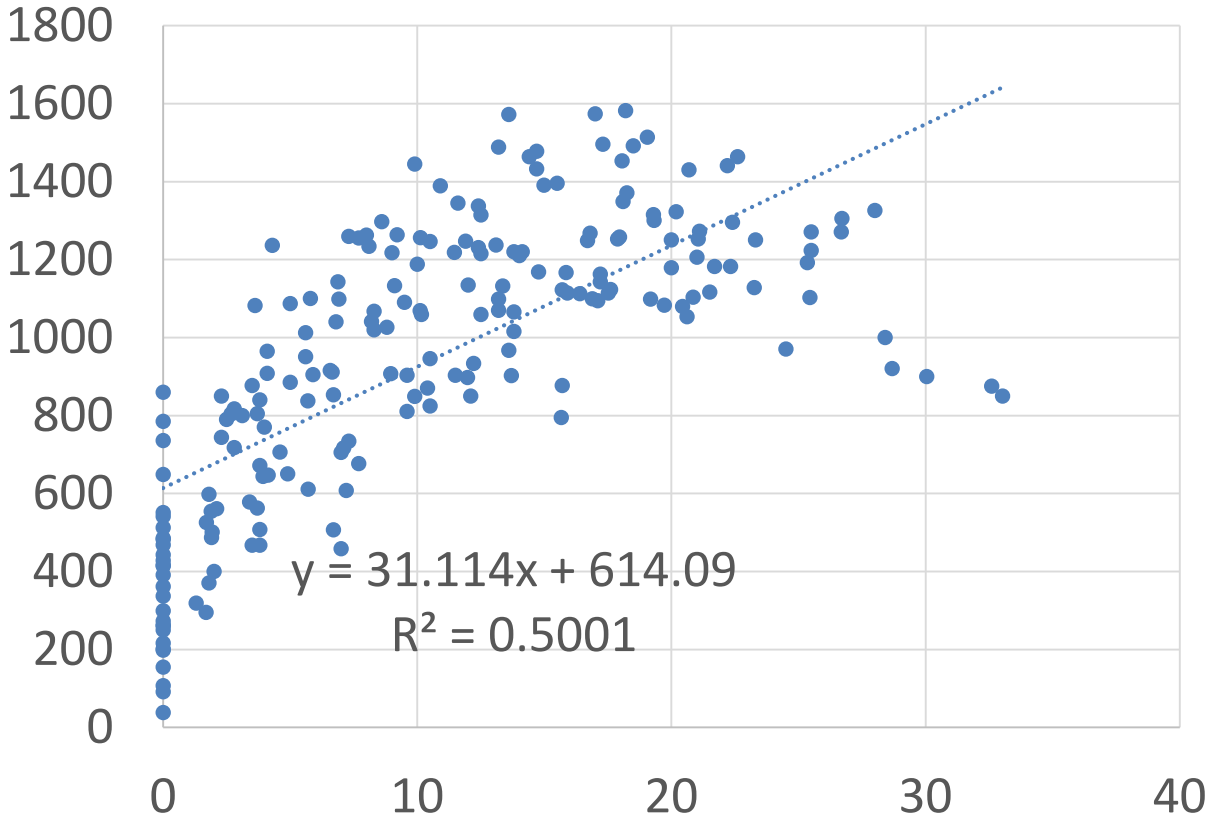


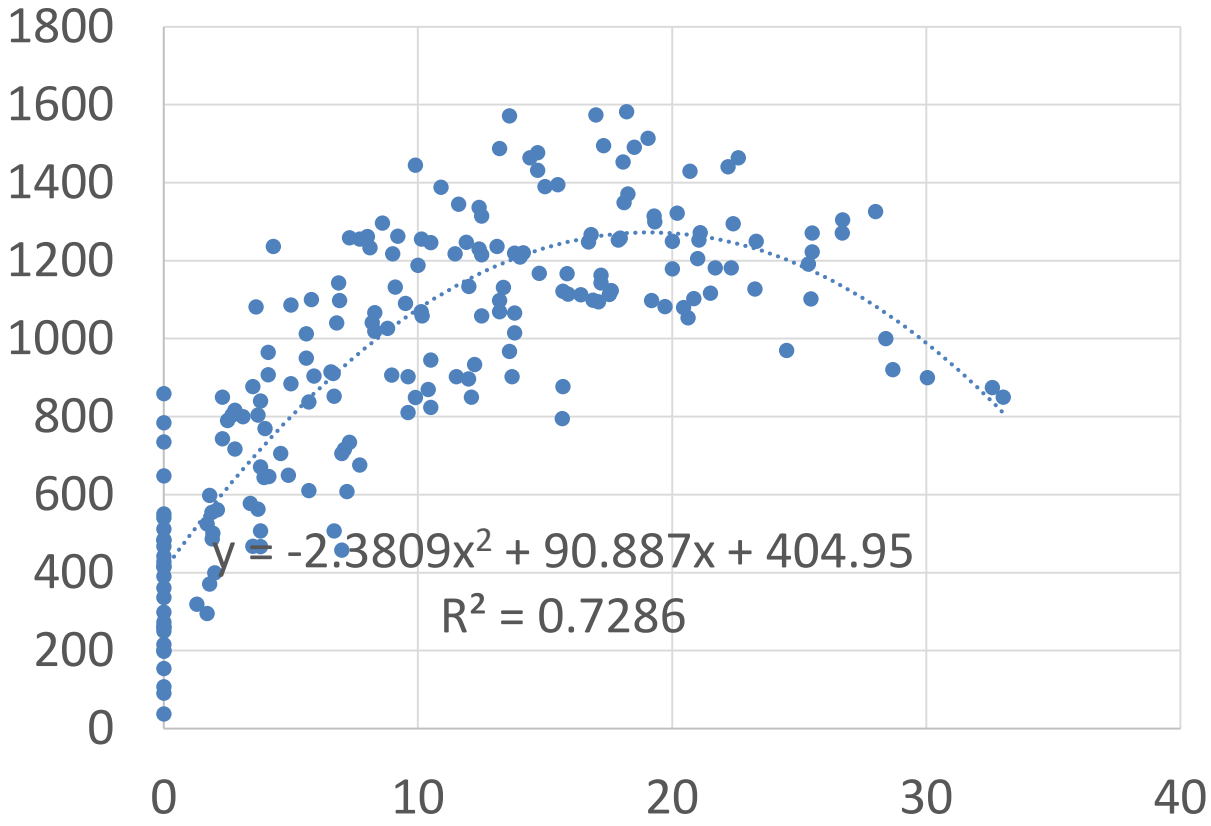


Introduction: AGBU 3385

Simplified datasets are used for deeper understanding

Eg: Regression Analysis





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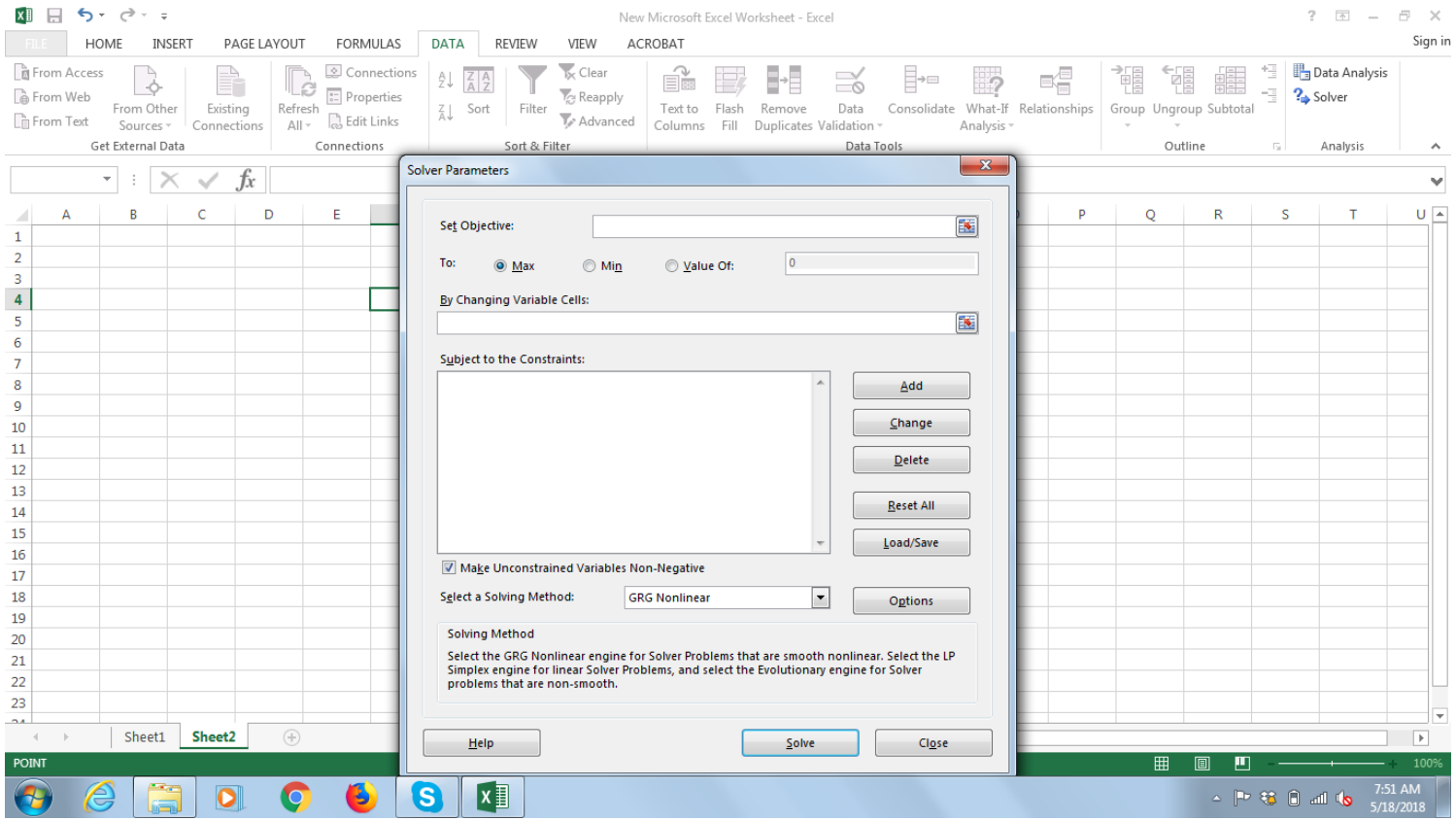
Open Excel Exams

Eg: Linear Programming



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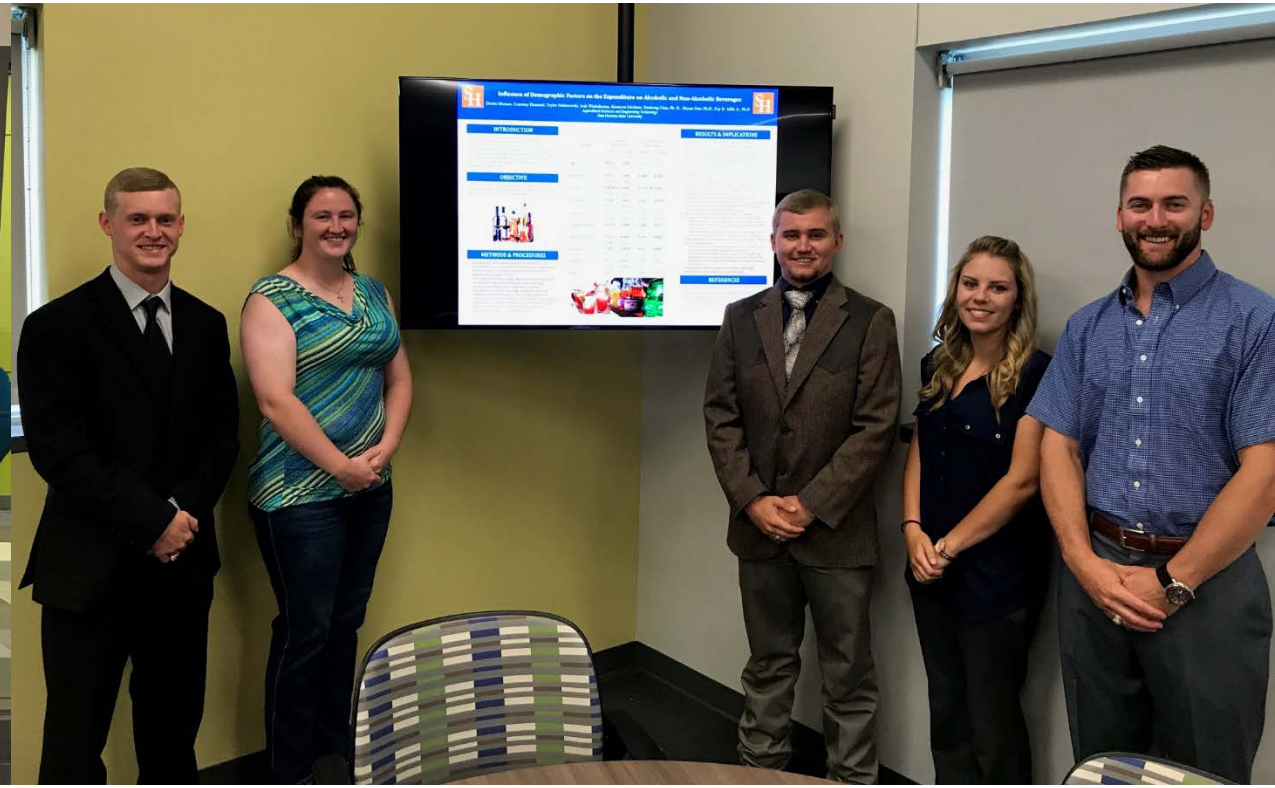
Project-Based Learning

- ❑ Student teams work on research projects
- ❑ Any project that can provide information from data
- ❑ Students present research posters developed (Final Exam)



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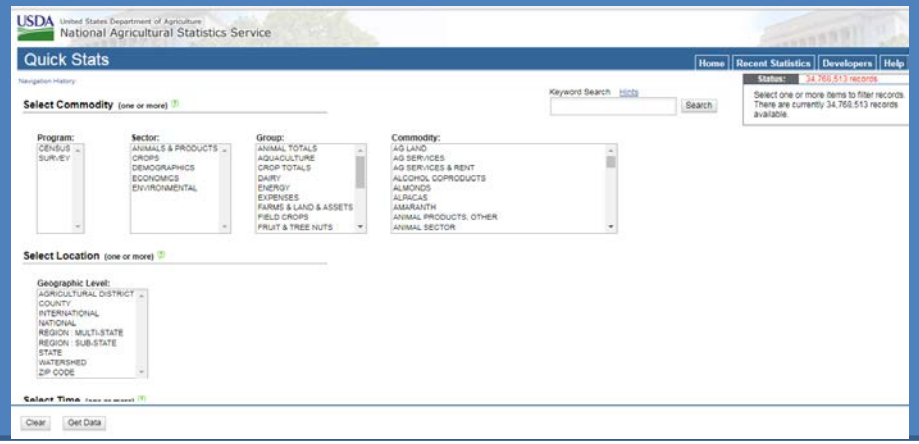
Planning

- ❑ Discussions with faculty members
- ❑ Manageable project
- ❑ Datasets: Already collected or publicly available

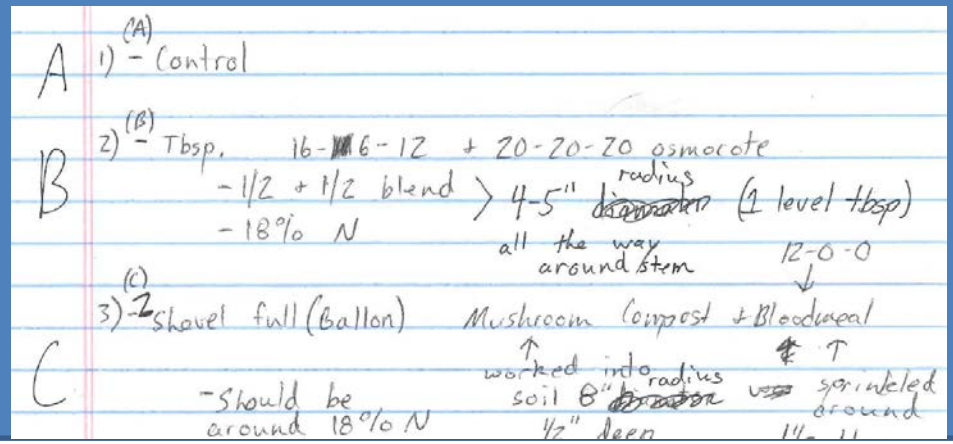
Analyzing Changes in Agricultural Land use

Historic crop acreage and price data available from USDA NASS QuickStats



Impact of Soil Treatments on Olive Frost Damage

Data already collected from a field experiment



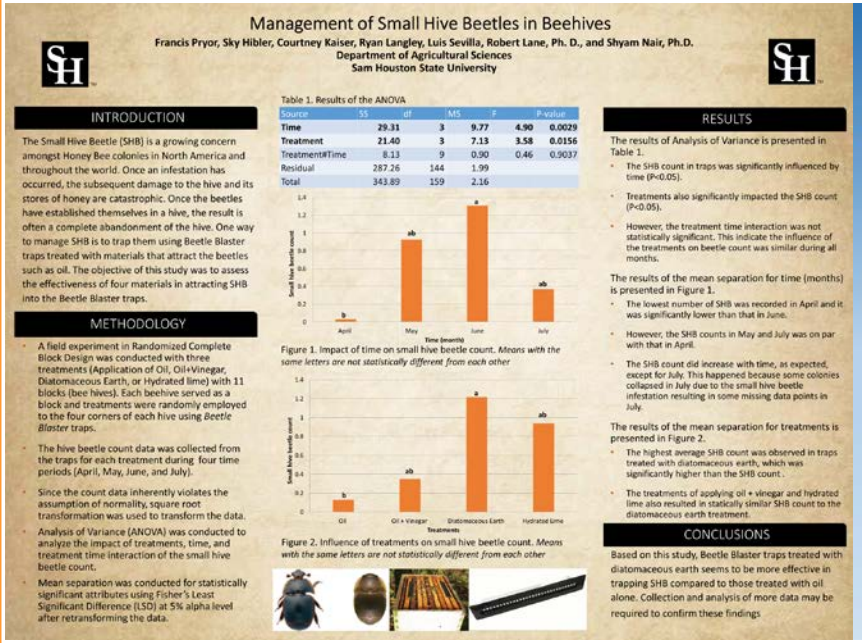
Teams and project assignment

- Class capped at 30 (usually full)
- Six teams of 5 students each
- Randomize team order for choosing project

Randomized team order	#	Available Projects
5	1	Students' performance in two agricultural teacher certification tests
1	2	Can exercise reduce depression?
4	3	Influence of soil amendments on the growth of olives
2	4	Analysis of prediction accuracy of US peanut production
3	5	Optimizing feed ration for beef cattle
6	6	The association between smoking and general health

Meeting with the teams

- ❑ 30 minutes meeting with each team
- ❑ Describing the data
- ❑ Examples of posters



Management of Small Hive Beetles in Beehives

Francis Pryor, Sky Hibler, Courtney Kaiser, Ryan Langley, Luis Sevilla, Robert Lane, Ph. D., and Shyam Nair, Ph.D.
Department of Agricultural Sciences
Sam Houston State University

INTRODUCTION

The Small Hive Beetle (SHB) is a growing concern amongst Honey Bee colonies in North America and throughout the world. Once an infestation has occurred, the subsequent damage to the hive and its stores of honey are catastrophic. Once the beetles have established themselves in a hive, the result is often a complete abandonment of the hive. One way to manage SHB is to trap them using Beetle Blaster traps treated with materials that attract the beetles such as oil. The objective of this study was to assess the effectiveness of four materials in attracting SHB into the Beetle Blaster traps.

METHODOLOGY

- A field experiment in Randomized Complete Block Design was conducted with three treatments (Application of Oil, Oil+Vinegar, Diatomaceous Earth, or Hydrated lime) with 11 blocks (bee hives). Each beehive served as a block and treatments were randomly employed to the four corners of each hive using *Beetle Blaster* traps.
- The hive beetle count data was collected from the traps for each treatment during four time periods (April, May, June, and July).
- Since the count data inherently violates the assumption of normality, square root transformation was used to transform the data.
- Analysis of Variance (ANOVA) was conducted to analyze the impact of treatments, time, and treatment time interaction of the small hive beetle count.
- Mean separation was conducted for statistically significant attributes using Fisher's Least Significant Difference (LSD) at 5% alpha level after retransforming the data.

Table 1. Results of the ANOVA

Source	SS	df	MS	F	P-value
Time	29.31	3	9.77	4.90	0.0029
Treatment	21.40	3	7.13	3.58	0.0156
Treatment#Time	8.13	9	0.90	0.46	0.9037
Residual	287.26	144	1.99		
Total	343.89	159	2.16		

Figure 1. Impact of time on small hive beetle count. *Means with the same letters are not statistically different from each other*

Figure 2. Influence of treatments on small hive beetle count. *Means with the same letters are not statistically different from each other*

RESULTS

The results of Analysis of Variance is presented in Table 1.

- The SHB count in traps was significantly influenced by time (P<0.05).
- Treatments also significantly impacted the SHB count (P<0.05).
- However, the treatment time interaction was not statistically significant. This indicate the influence of the treatments on beetle count was similar during all months.

The results of the mean separation for time (months) is presented in Figure 1.

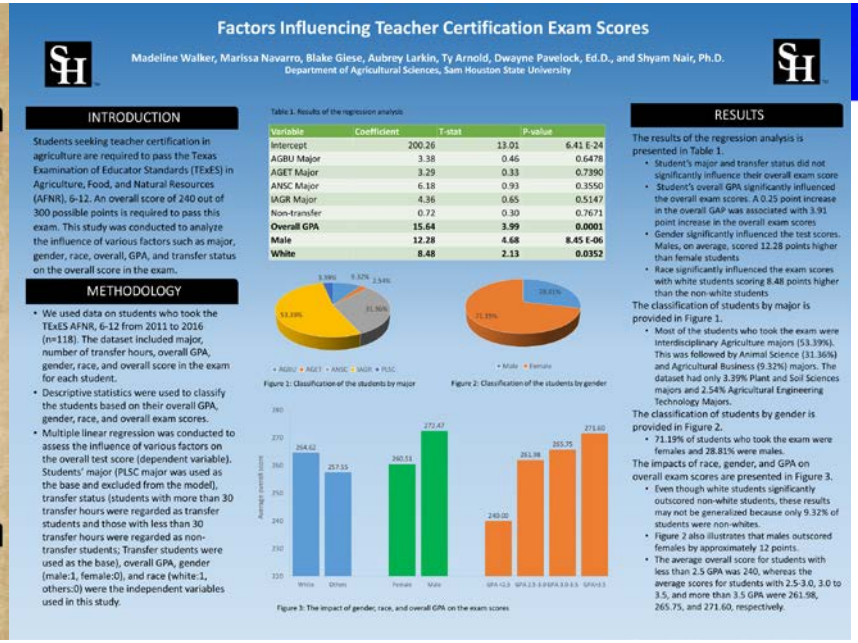
- The lowest number of SHB was recorded in April and it was significantly lower than that in June.
- However, the SHB counts in May and July was on par with that in April.
- The SHB count did increase with time, as expected, except for July. This happened because some colonies collapsed in July due to the small hive beetle infestation resulting in some missing data points in July.

The results of the mean separation for treatments is presented in Figure 2.

- The highest average SHB count was observed in traps treated with diatomaceous earth, which was significantly higher than the SHB count.
- The treatments of applying oil + vinegar and hydrated lime also resulted in statically similar SHB count to the diatomaceous earth treatment.

CONCLUSIONS

Based on this study, Beetle Blaster traps treated with diatomaceous earth seems to be more effective in trapping SHB compared to those treated with oil alone. Collection and analysis of more data may be required to confirm these findings



Factors Influencing Teacher Certification Exam Scores

Madeline Walker, Marissa Navarro, Blake Giese, Aubrey Larkin, Ty Arnold, Dwayne Pavelock, Ed.D., and Shyam Nair, Ph.D.
Department of Agricultural Sciences, Sam Houston State University

INTRODUCTION

Students seeking teacher certification in agriculture are required to pass the Texas Examination of Educator Standards (TExES) in Agriculture, Food, and Natural Resources (AFNR), 6-12. An overall score of 240 out of 300 possible points is required to pass this exam. This study was conducted to analyze the influence of various factors such as major, gender, race, overall, GPA, and transfer status on the overall score in the exam.

METHODOLOGY

- We used data on students who took the TExES AFNR, 6-12 from 2011 to 2016 (n=118). The dataset included major, number of transfer hours, overall GPA, gender, race, and overall score in the exam for each student.
- Descriptive statistics were used to classify the students based on their overall GPA, gender, race, and overall exam scores.
- Multiple linear regression was conducted to assess the influence of various factors on the overall test score (dependent variable). Students' major (PLSC major was used as the base and excluded from the model), transfer status (students with more than 30 transfer hours were regarded as transfer students and those with less than 30 transfer hours were regarded as non-transfer students; Transfer students were used as the base), overall GPA, gender (male:1, female:0), and race (white:1, others:0) were the independent variables used in this study.

Table 1. Results of the regression analysis

Variable	Coefficient	T-stat	P-value
Intercept	200.26	13.01	6.41 E-24
AGBU Major	3.38	0.46	0.6478
AGET Major	3.29	0.33	0.7390
ANSC Major	6.18	0.93	0.3550
IAGR Major	4.36	0.65	0.5147
Non-transfer	0.72	0.30	0.7671
Overall GPA	**15.64**	**3.99**	**0.0001**
Male	**12.28**	**4.68**	**8.45 E-06**
White	**8.48**	**2.13**	**0.0352**

Figure 1: Classification of the students by major

Figure 2: Classification of the students by gender

Figure 3: The impact of gender, race, and overall GPA on the exam scores

RESULTS

The results of the regression analysis is presented in Table 1.

- Student's major and transfer status did not significantly influence their overall exam score
- Student's overall GPA significantly influenced the overall exam scores. A 0.25 point increase in the overall GAP was associated with 3.91 point increase in the overall exam scores
- Gender significantly influenced the test scores. Males, on average, scored 12.28 points higher than female students
- Race significantly influenced the exam scores with white students scoring 8.48 points higher than the non-white students

The classification of students by major is provided in Figure 1.

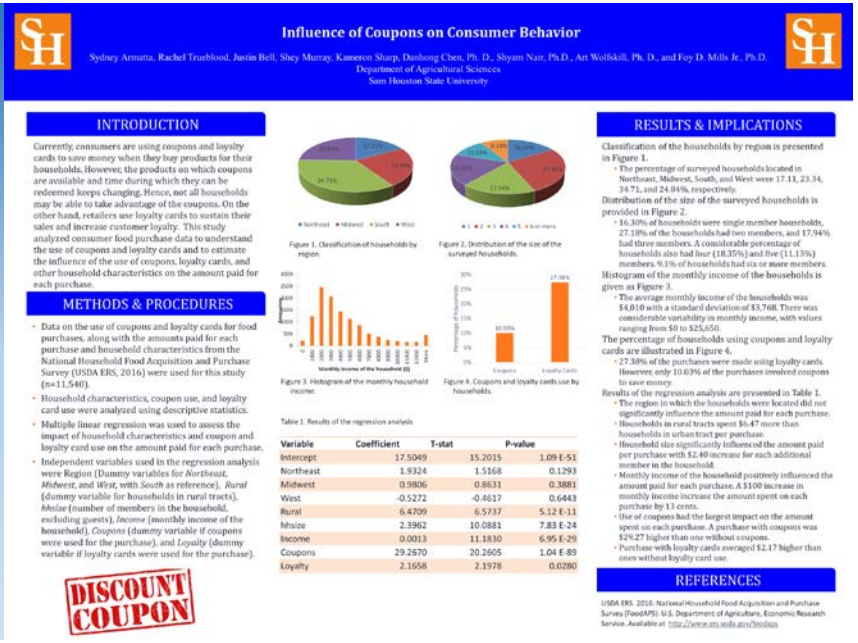
- Most of the students who took the exam were Interdisciplinary Agriculture majors (53.39%). This was followed by Animal Science (31.36%) and Agricultural Business (9.32%) majors. The dataset had only 3.39% Plant and Soil Sciences majors and 2.54% Agricultural Engineering Technology Majors.

The classification of students by gender is provided in Figure 2.

- 71.19% of students who took the exam were females and 28.81% were males.

The impacts of race, gender, and GPA on overall exam scores are presented in Figure 3.

- Even though white students significantly outscored non-white students, these results may not be generalized because only 9.32% of students were non-whites.
- Figure 2 also illustrates that males outscored females by approximately 12 points.
- The average overall score for students with less than 2.5 GPA was 240, whereas the average scores for students with 2.5-3.0, 3.0 to 3.5, and more than 3.5 GPA were 261.98, 265.75, and 271.60, respectively.



Influence of Coupons on Consumer Behavior

Sydney Armatta, Rachel Trueblood, Justin Bell, Shey Murray, Kameron Sharp, Danhong Chen, Ph. D., Shyam Nair, Ph.D., Art Wolfskill, Ph. D., and Foy D. Mills Jr., Ph.D.
Department of Agricultural Sciences
Sam Houston State University

INTRODUCTION

Currently, consumers are using coupons and loyalty cards to save money when they buy products for their households. However, the products on which coupons are available and time during which they can be redeemed keeps changing. Hence, not all households may be able to take advantage of the coupons. On the other hand, retailers use loyalty cards to sustain their sales and increase customer loyalty. This study analyzed consumer food purchase data to understand the use of coupons and loyalty cards and to estimate the influence of the use of coupons, loyalty cards, and other household characteristics on the amount paid for each purchase.

METHODS & PROCEDURES

- Data on the use of coupons and loyalty cards for food purchases, along with the amounts paid for each purchase and household characteristics from the National Household Food Acquisition and Purchase Survey (USDA ERS, 2016) were used for this study (n=11,540).
- Household characteristics, coupon use, and loyalty card use were analyzed using descriptive statistics.
- Multiple linear regression was used to assess the impact of household characteristics and coupon and loyalty card use on the amount paid for each purchase.
- Independent variables used in the regression analysis were Region (Dummy variables for *Northeast, Midwest*, and *West*, with *South* as reference), *Rural* (dummy variable for households in rural tracts), *hhsize* (number of members in the household, excluding guests), *Income* (monthly income of the household), *Coupons* (dummy variable if coupons were used for the purchase), and *Loyalty* (dummy variable if loyalty cards were used for the purchase).

Figure 3. Histogram of the monthly household income.

Figure 4. Coupons and loyalty cards use by households.

Table 1. Results of the regression analysis

Variable	Coefficient	T-stat	P-value
Intercept	17.5049	15.2015	1.09 E-51
Northeast	1.9324	1.5168	0.1293
Midwest	0.9806	0.8631	0.3881
West	-0.5272	-0.4617	0.6443
Rural	6.4709	6.5737	5.12 E-11
hhsize	2.3962	10.0881	7.83 E-24
Income	0.0013	11.1830	6.95 E-29
Coupons	29.2670	20.2605	1.04 E-89
Loyalty	2.1658	2.1978	0.0280

RESULTS & IMPLICATIONS

Classification of the households by region is presented in Figure 1.

- The percentage of surveyed households located in Northeast, Midwest, South, and West were 17.11, 23.34, 34.71, and 24.84%, respectively.

Distribution of the size of the surveyed households is provided in Figure 2.

- 16.30% of households were single member households, 27.18% of the households had two members, and 17.94% had three members. A considerable percentage of households also had four (18.35%) and five (11.13%) members. 9.1% of households had six or more members.

Histogram of the monthly income of the households is given as Figure 3.

- The average monthly income of the households was $4,010 with a standard deviation of $3,768. There was considerable variability in monthly income, with values ranging from $0 to $25,650.

The percentage of households using coupons and loyalty cards are illustrated in Figure 4.

- 27.38% of the purchases were made using loyalty cards. However, only 10.63% of the purchases involved coupons to save money.

Results of the regression analysis are presented in Table 1.

- The region in which the households were located did not significantly influence the amount paid for each purchase.
- Households in rural tracts spent $6.47 more than households in urban tract per purchase.
- Household size significantly influenced the amount paid per purchase with $2.40 increase for each additional member in the household.
- Monthly income of the household positively influenced the amount paid for each purchase. A $100 increase in monthly income increase the amount spent on each purchase by 13 cents.
- Use of coupons had the largest impact on the amount spent on each purchase. A purchase with coupons was $29.27 higher than one without coupons.
- Purchase with loyalty cards averaged $2.17 higher than ones without loyalty card use.

REFERENCES

USDA ERS. 2016. National Household Food Acquisition and Purchase Survey (FoodAPS). U.S. Department of Agriculture, Economic Research Service. Available at: http://www.ers.usda.gov/foodaps

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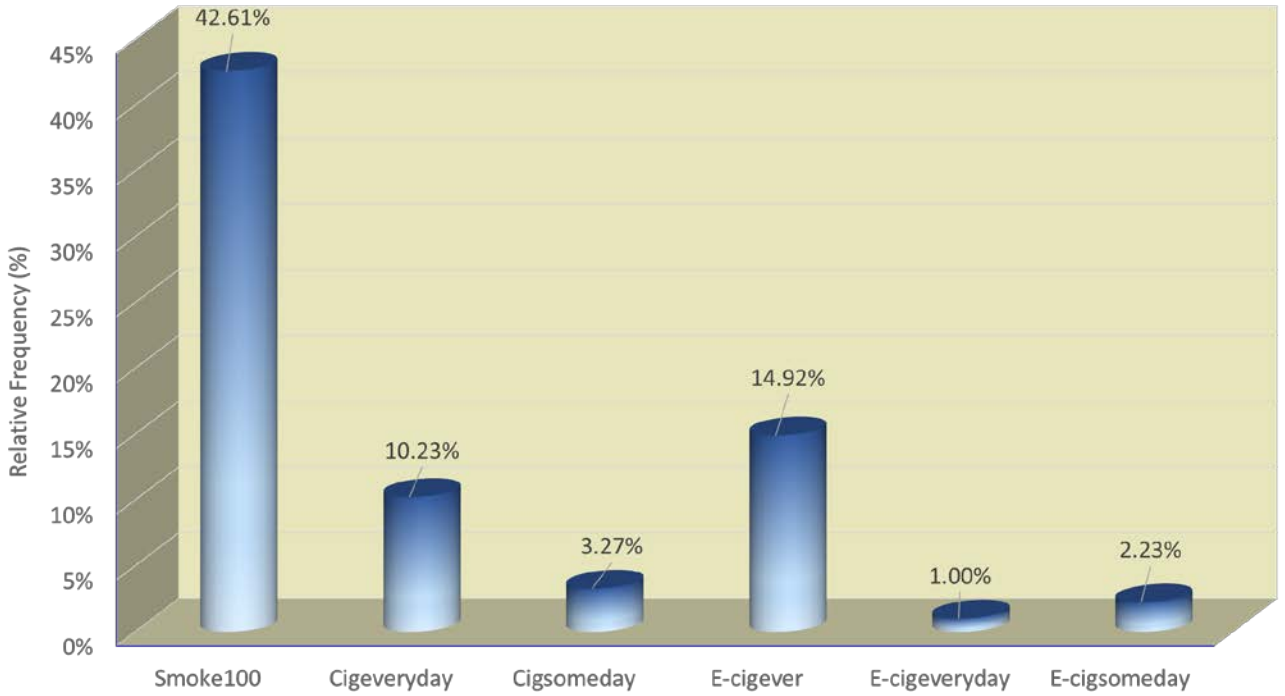
Activities outside class

- ❑ Literature review
- ❑ Analysis of individual variables
- ❑ Graphing variables and relationships



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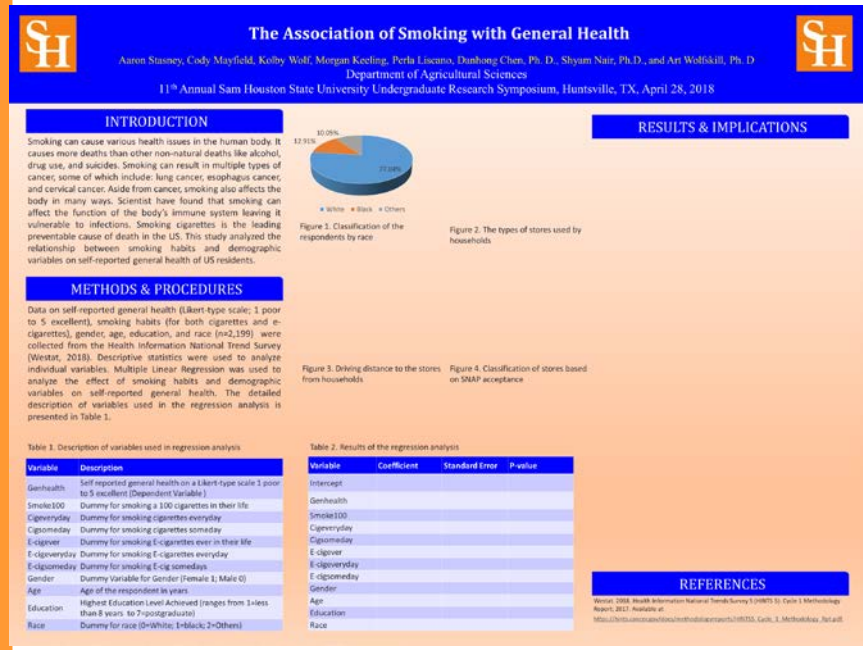
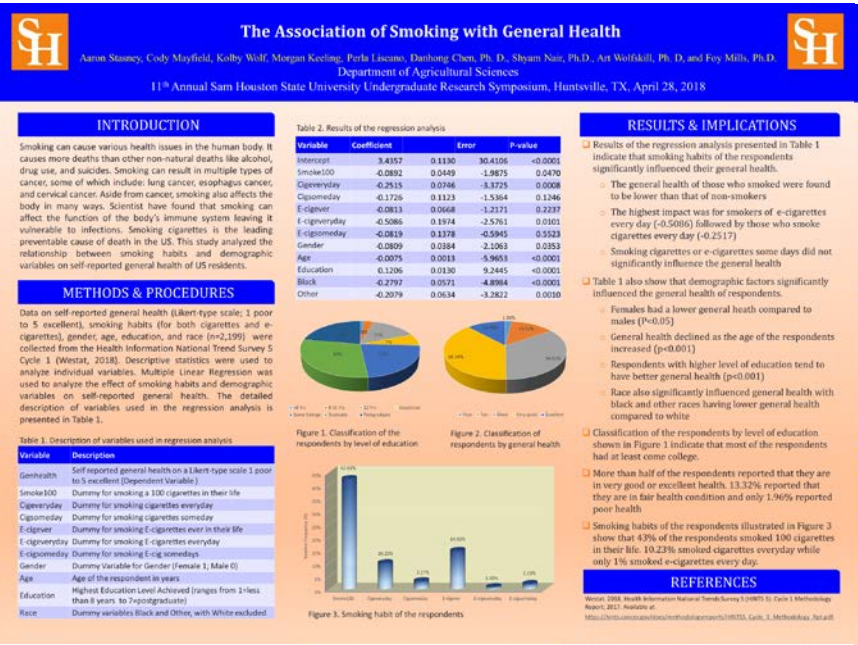
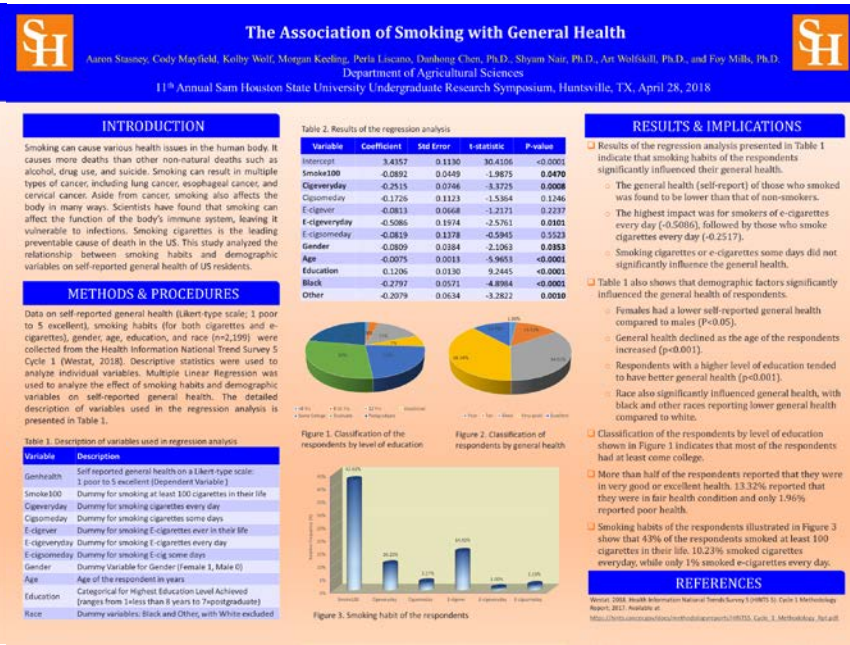
Activities in class

- ❑ Choice of poster template
- ❑ Data analysis
- ❑ Putting together the poster







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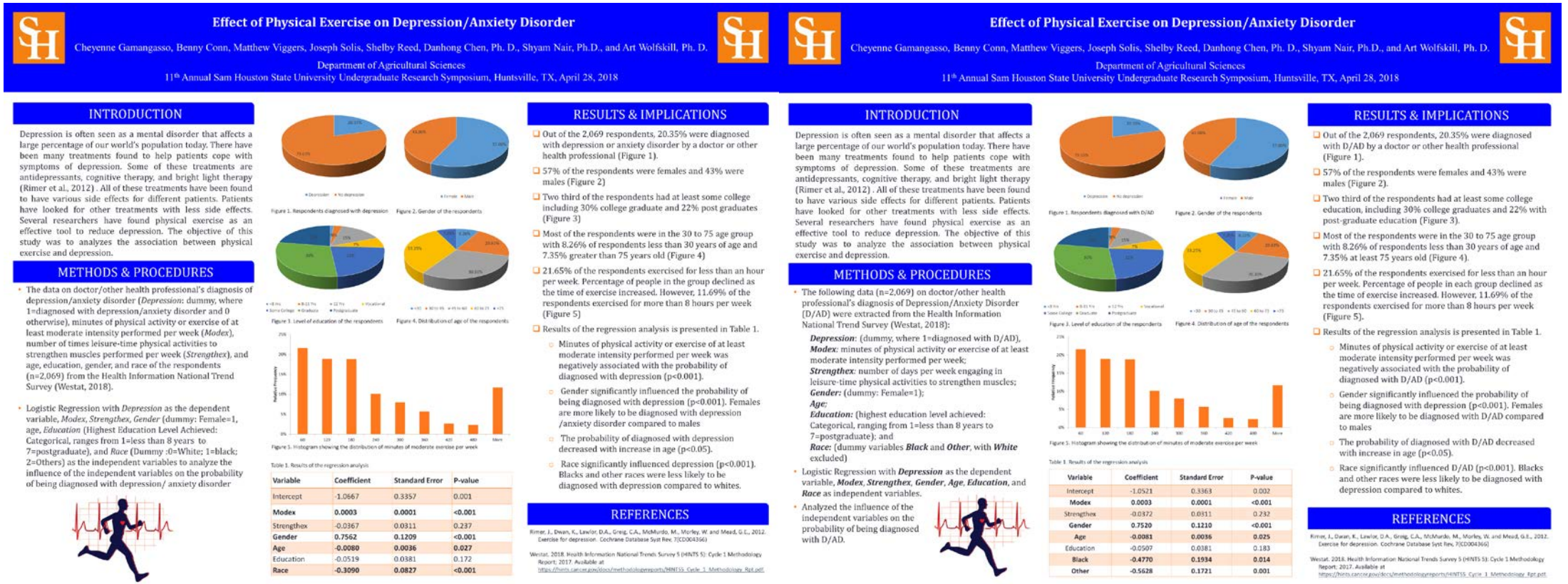
Final Edits

- ❑ Instructor and supporting faculty members
- ❑ Typos, grammar, style etc.



Effect of Physical Exercise on Depression/Anxiety Disorder

Cheyenne Gamangasso, Benny Conn, Matthew Viggers, Joseph Solis, Shelby Reed, Danhong Chen, Ph. D., Shyam Nair, Ph.D., and Art Wolfskill, Ph. D.
Department of Agricultural Sciences
11th Annual Sam Houston State University Undergraduate Research Symposium, Huntsville, TX, April 28, 2018

INTRODUCTION

Depression is often seen as a mental disorder that affects a large percentage of our world's population today. There have been many treatments found to help patients cope with symptoms of depression. Some of these treatments are antidepressants, cognitive therapy, and bright light therapy (Rimer et al., 2012) . All of these treatments have been found to have various side effects for different patients. Patients have looked for other treatments with less side effects. Several researchers have found physical exercise as an effective tool to reduce depression. The objective of this study was to analyzes the association between physical exercise and depression.

METHODS & PROCEDURES

- The data on doctor/other health professional's diagnosis of depression/anxiety disorder (*Depression*: dummy, where 1=diagnosed with depression/anxiety disorder and 0 otherwise), minutes of physical activity or exercise of at least moderate intensity performed per week (*Modex*), number of times leisure-time physical activities to strengthen muscles performed per week (*Strengthex*), and age, education, gender, and race of the respondents (n=2,069) from the Health Information National Trend Survey (Westat, 2018).
- Logistic Regression with *Depression* as the dependent variable, *Modex*, *Strengthex*, *Gender* (dummy: Female=1, age, *Education* (Highest Education Level Achieved: Categorical, ranges from 1=less than 8 years to 7=postgraduate), and *Race* (Dummy :0=White; 1=black; 2=Others) as the independent variables to analyze the influence of the independent variables on the probability of being diagnosed with depression/ anxiety disorder

Figure 1. Respondents diagnosed with depression

Figure 2. Gender of the respondents

Figure 3. Level of education of the respondents

Figure 4. Distribution of age of the respondents

Figure 5. Histogram showing the distribution of minutes of moderate exercise per week

Table 1. Results of the regression analysis

Variable	Coefficient	Standard Error	P-value
Intercept	-1.0667	0.3357	0.001
Modex	**0.0003**	**0.0001**	**<0.001**
Strengthex	-0.0367	0.0311	0.237
Gender	**0.7562**	**0.1209**	**<0.001**
Age	**-0.0080**	**0.0036**	**0.027**
Education	-0.0519	0.0381	0.172
Race	**-0.3090**	**0.0827**	**<0.001**

RESULTS & IMPLICATIONS

- Out of the 2,069 respondents, 20.35% were diagnosed with depression or anxiety disorder by a doctor or other health professional (Figure 1).
- 57% of the respondents were females and 43% were males (Figure 2)
- Two third of the respondents had at least some college including 30% college graduate and 22% post graduates (Figure 3)
- Most of the respondents were in the 30 to 75 age group with 8.26% of respondents less than 30 years of age and 7.35% greater than 75 years old (Figure 4)
- 21.65% of the respondents exercised for less than an hour per week. Percentage of people in the group declined as the time of exercise increased. However, 11.69% of the respondents exercised for more than 8 hours per week (Figure 5)
- Results of the regression analysis is presented in Table 1.
  - Minutes of physical activity or exercise of at least moderate intensity performed per week was negatively associated with the probability of diagnosed with depression ($p<0.001$).
  - Gender significantly influenced the probability of being diagnosed with depression ($p<0.001$). Females are more likely to be diagnosed with depression /anxiety disorder compared to males
  - The probability of diagnosed with depression decreased with increase in age ($p<0.05$).
  - Race significantly influenced depression ($p<0.001$). Blacks and other races were less likely to be diagnosed with depression compared to whites.

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Effect of Physical Exercise on Depression/Anxiety Disorder

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METHODS & PROCEDURES

- The following data (n=2,069) on doctor/other health professional's diagnosis of Depression/Anxiety Disorder (D/AD) were extracted from the Health Information National Trend Survey (Westat, 2018):
  Depression: (dummy, where 1=diagnosed with D/AD),
  Modex: minutes of physical activity or exercise of at least moderate intensity performed per week;
  Strengthex: number of days per week engaging in leisure-time physical activities to strengthen muscles;
  Gender: (dummy: Female=1);
  Age;
  Education: (highest education level achieved: Categorical, ranging from 1=less than 8 years to 7=postgraduate); and
  Race: (dummy variables ***Black*** and ***Other***, with ***White*** excluded)
- Logistic Regression with ***Depression*** as the dependent variable, ***Modex***, ***Strengthex***, ***Gender***, ***Age***, ***Education***, and ***Race*** as independent variables.
- Analyzed the influence of the independent variables on the probability of being diagnosed with D/AD.

Figure 1. Respondents diagnosed with D/AD

Figure 2. Gender of the respondents

Figure 3. Level of education of the respondents

Figure 4. Distribution of age of the respondents

Figure 5. Histogram showing the distribution of minutes of moderate exercise per week

Table 1. Results of the regression analysis

Variable	Coefficient	Standard Error	P-value
Intercept	-1.0521	0.3363	0.002
Modex	**0.0003**	**0.0001**	**<0.001**
Strengthex	-0.0372	0.0311	0.232
Gender	**0.7520**	**0.1210**	**<0.001**
Age	**-0.0081**	**0.0036**	**0.025**
Education	-0.0507	0.0381	0.183
Black	**-0.4770**	**0.1934**	**0.014**
Other	**-0.5628**	**0.1721**	**0.001**

RESULTS & IMPLICATIONS

- Out of the 2,069 respondents, 20.35% were diagnosed with D/AD by a doctor or other health professional (Figure 1).
- 57% of the respondents were females and 43% were males (Figure 2).
- Two third of the respondents had at least some college education, including 30% college graduates and 22% with post-graduate education (Figure 3).
- Most of the respondents were in the 30 to 75 age group with 8.26% of respondents less than 30 years of age and 7.35% at least 75 years old (Figure 4).
- 21.65% of the respondents exercised for less than an hour per week. Percentage of people in each group declined as the time of exercise increased. However, 11.69% of the respondents exercised for more than 8 hours per week (Figure 5).
- Results of the regression analysis is presented in Table 1.
  - Minutes of physical activity or exercise of at least moderate intensity performed per week was negatively associated with the probability of diagnosed with D/AD ($p<0.001$).
  - Gender significantly influenced the probability of being diagnosed with depression ($p<0.001$). Females are more likely to be diagnosed with D/AD compared to males
  - The probability of diagnosed with D/AD decreased with increase in age ($p<0.05$).
  - Race significantly influenced D/AD ($p<0.001$). Blacks and other races were less likely to be diagnosed with depression compared to whites.

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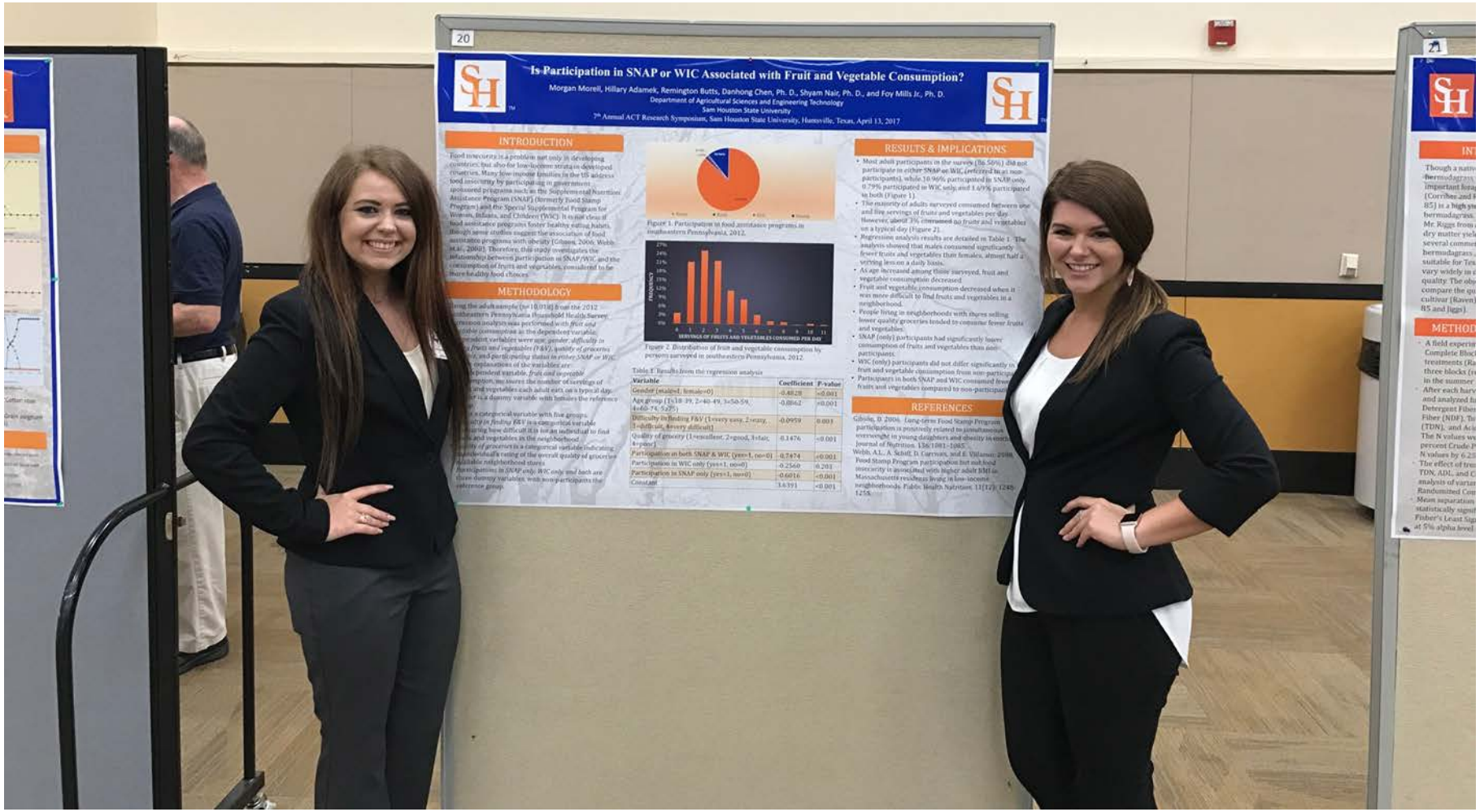

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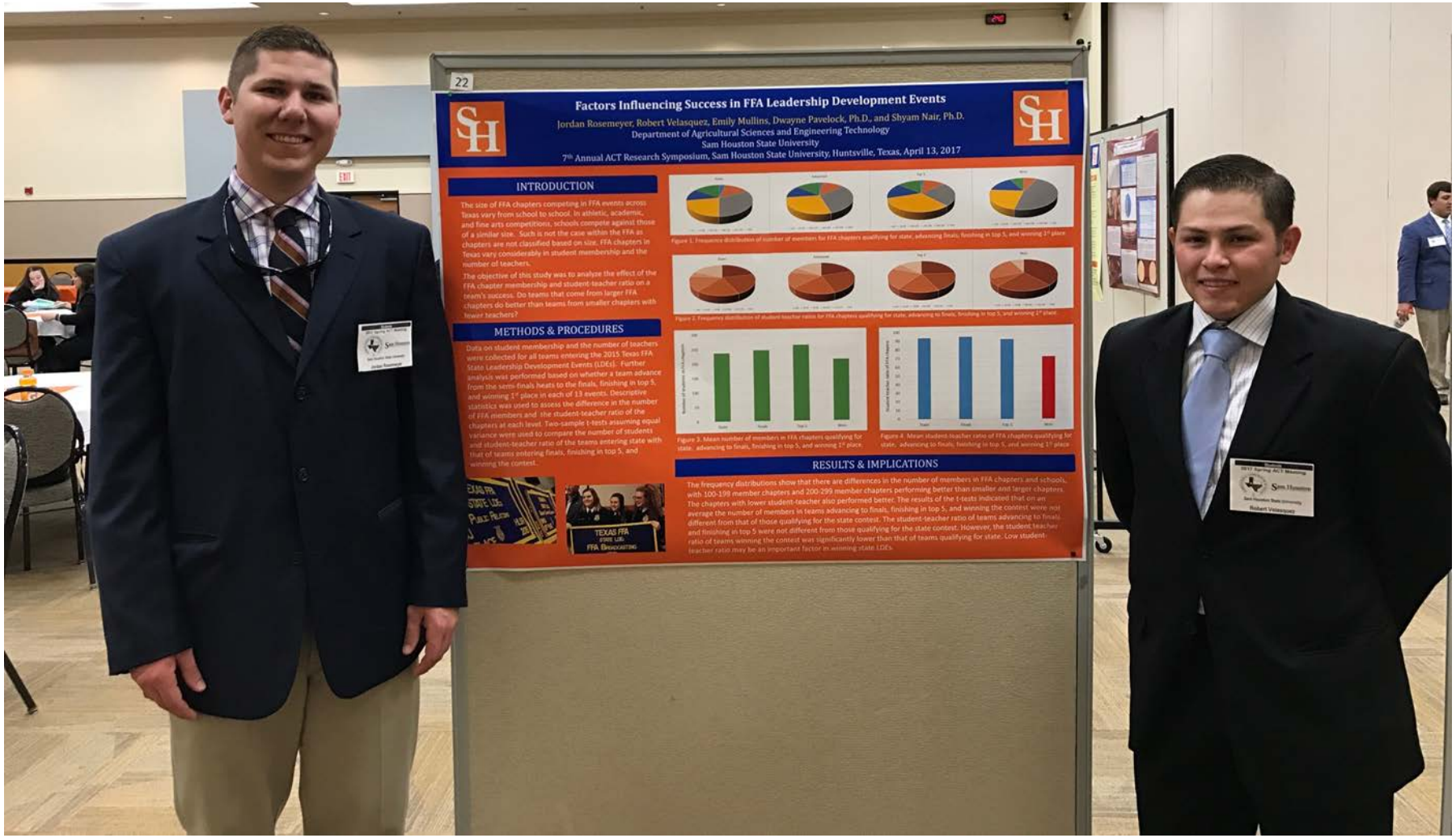

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