Correlating Gender Sensitivity and Learning Traits in Higher Education

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Why Data Analysis?

- Which "buy" button are users more likely to click on?

1 2 3 4

Statistical Tools

Small data statistics

- Excel –10M
- R Lang – 100 M

Large Datasets

- Python – 10G

Big data

- Splunk – 10 T
- Cloud map-reduce – 10 P

Agenda

1. Introduction
2. Survey
3. Comparative Opinions and Correlations
4. Conclusion
5. Appendix:

- References
- R Code and Survey Data
- Question and Answers

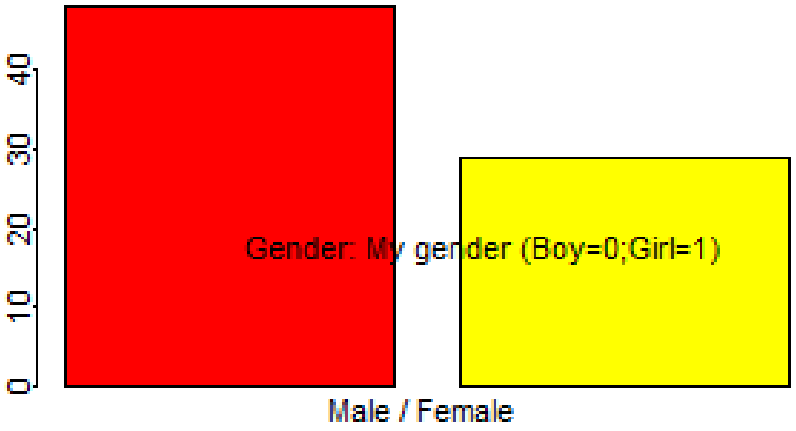
Introduction

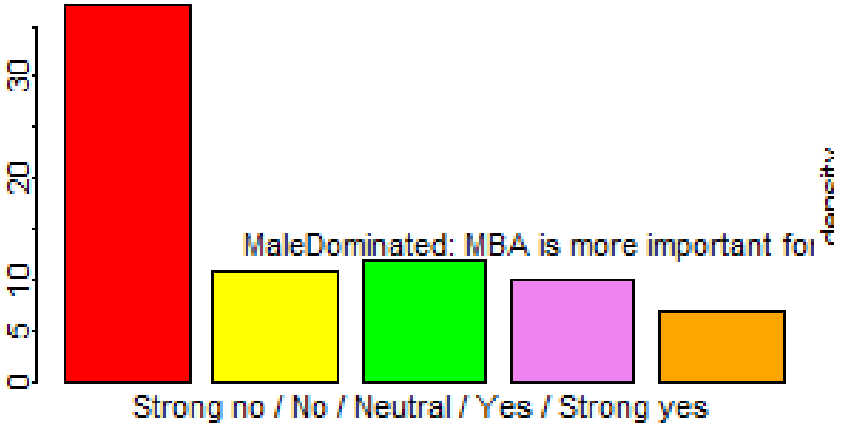
- We present the top positive and negative correlations for each of the 4 gender answers along with our insights.
- We used the t-test to identify major difference in opinions between the genders.
- We analyze the Google survey of MBA students in [3,4, Appendix 1].
- The data is analyzed using RLang in R-studio to find correlations between the four Gender Sensitivity answers and 51 other learning habits of MBA students.

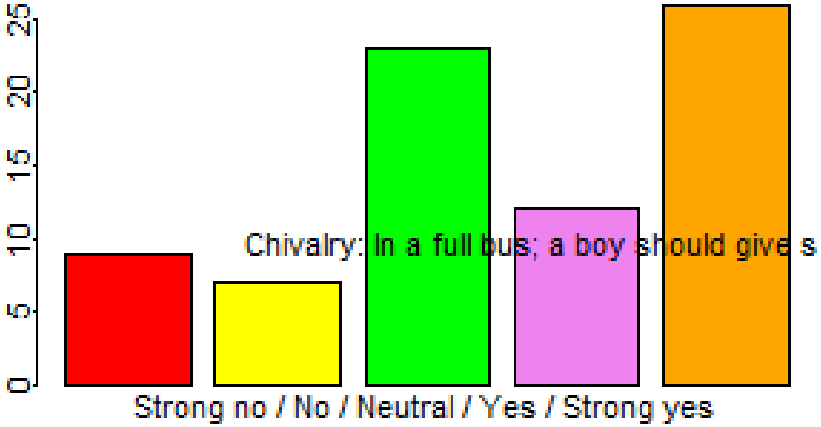
Results

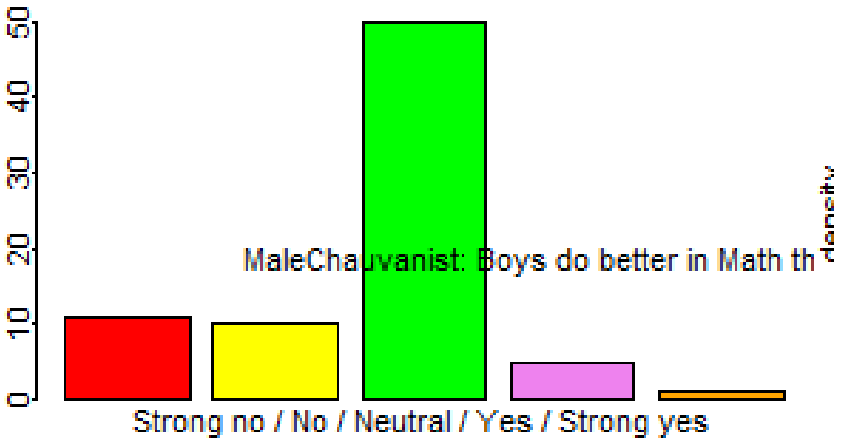
- We use R find learning traits that are positively and negatively correlated with gender sensitivity of students in the survey.
- Teachers can use this data to improve the teaching style that brings more gender sensitivity in the classroom learning.
- *Gender Sensitive* students are defined as those who believe in equality of male and female in work environment, and will empower both the genders.

Results we discuss in detail

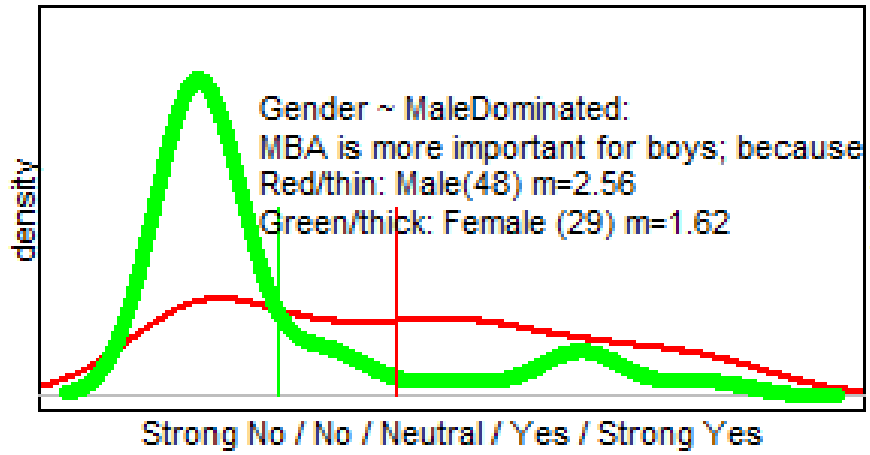


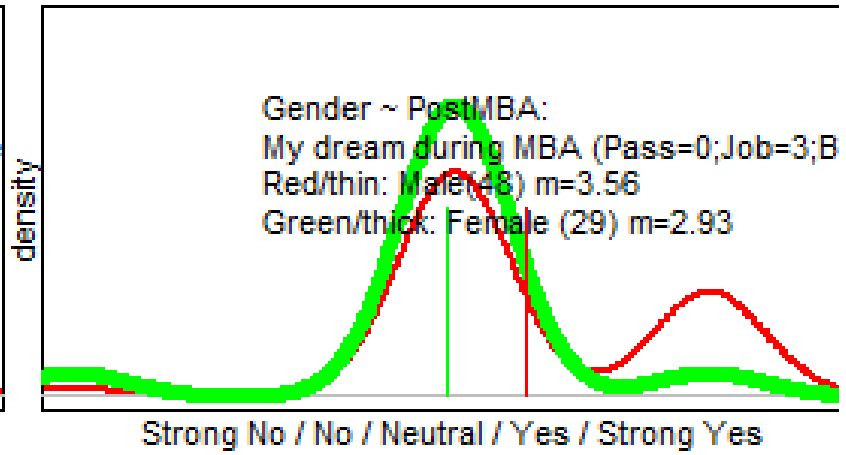


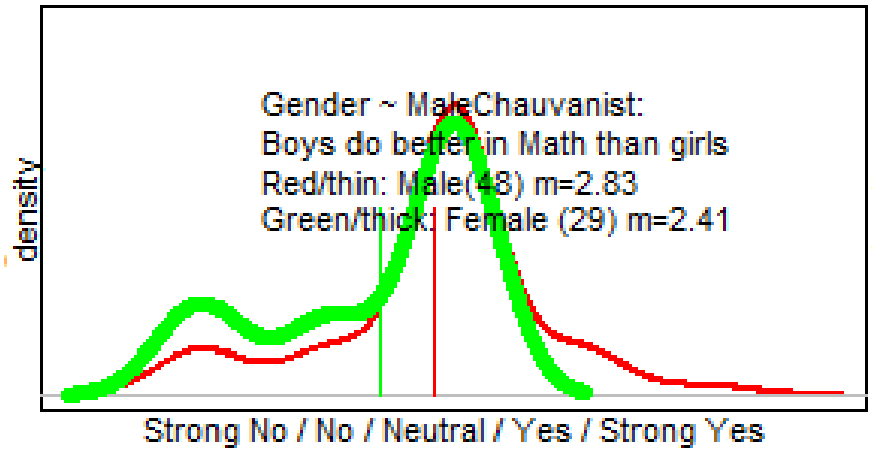


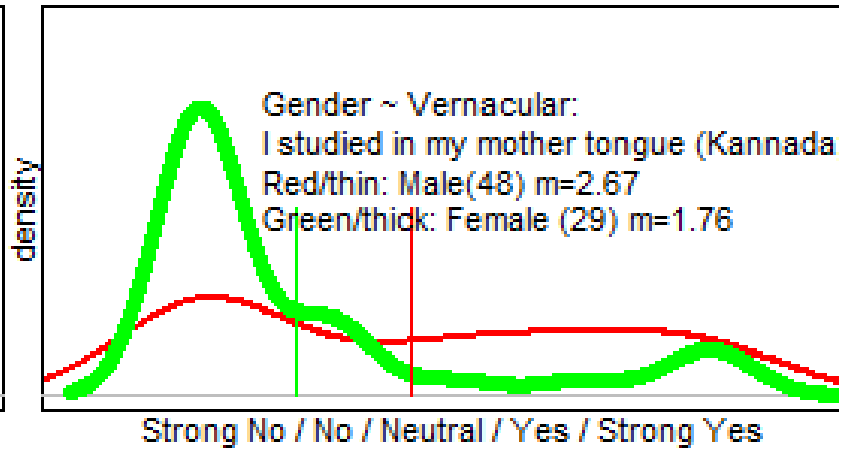


Distribution split by gender

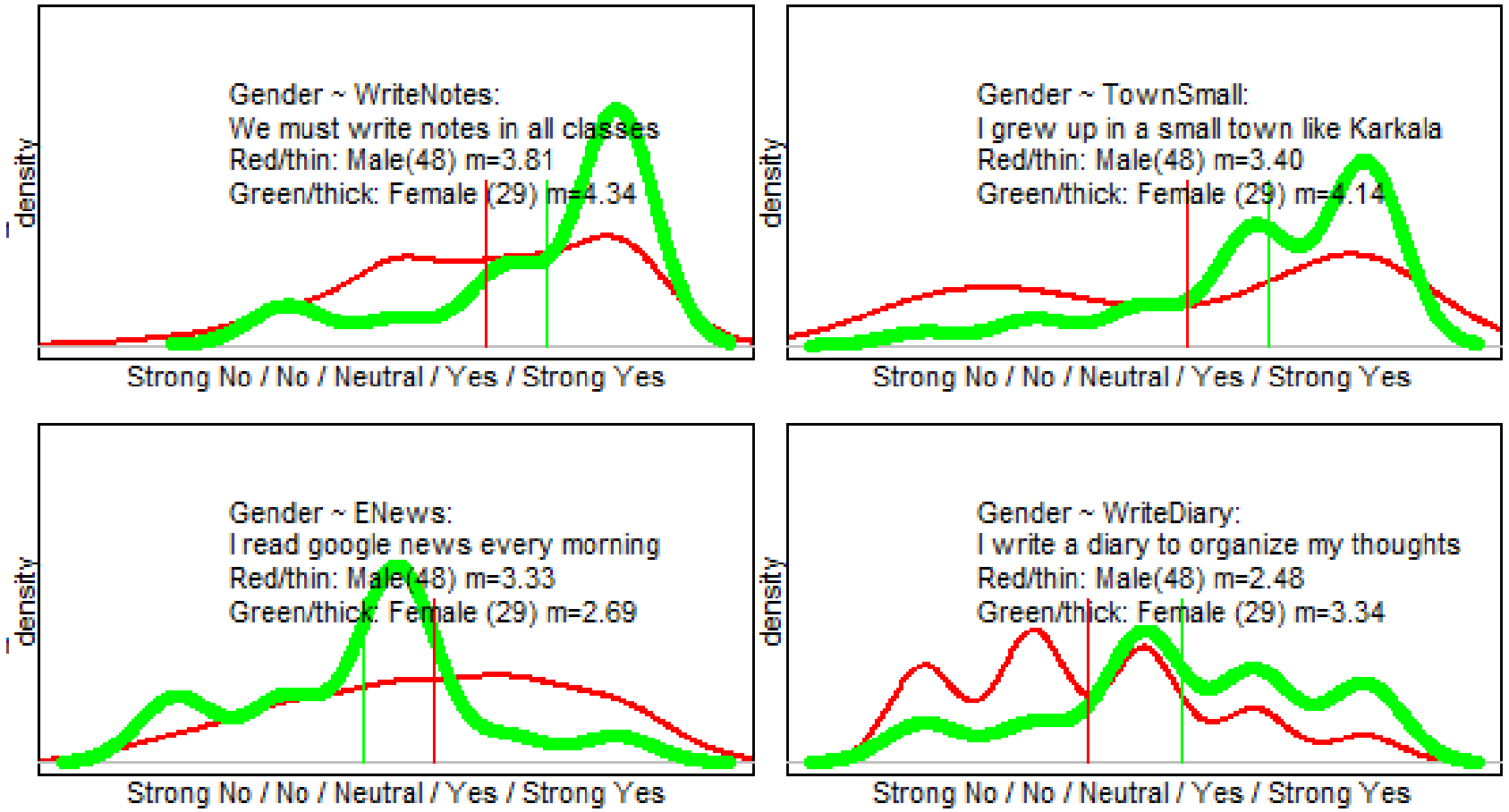




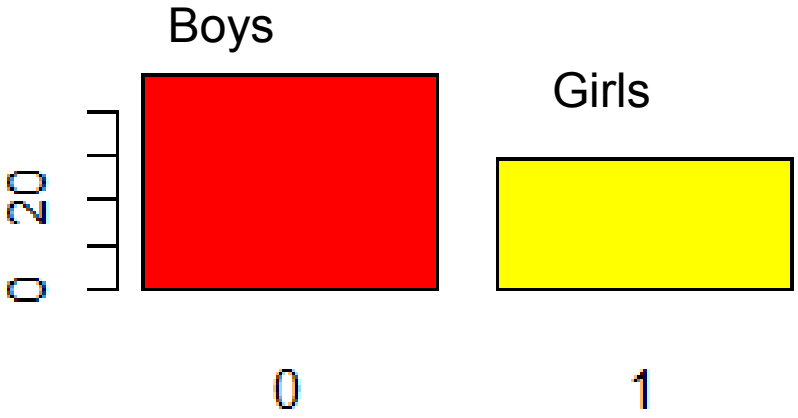




Distribution split by gender

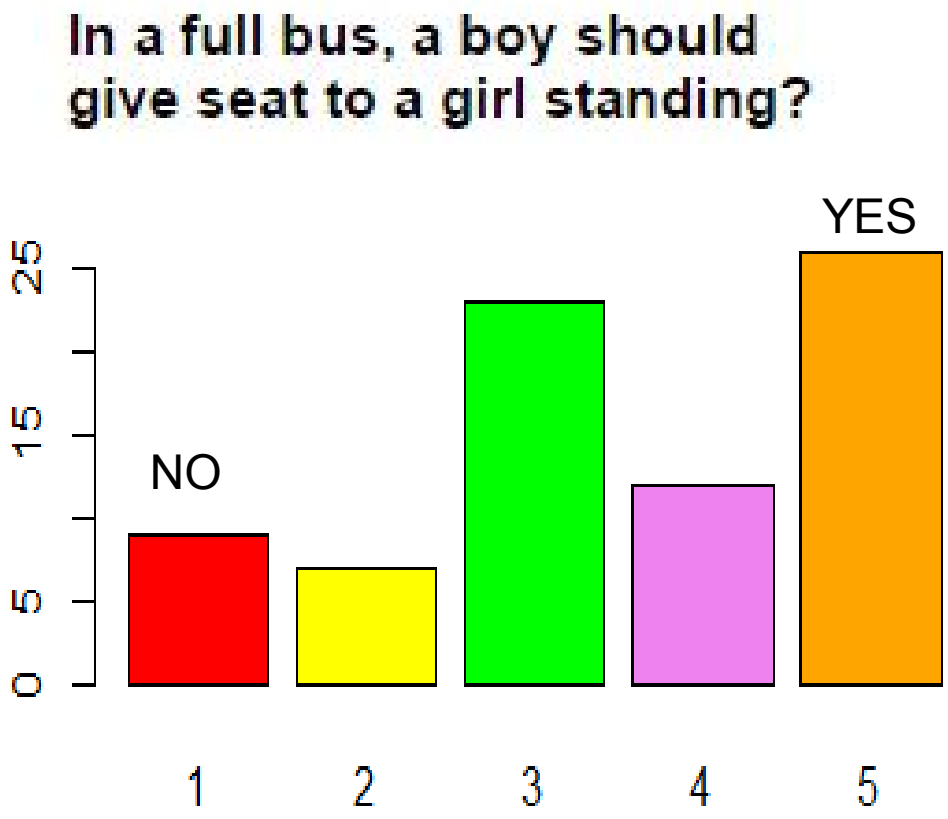


Q33. Gender in the survey



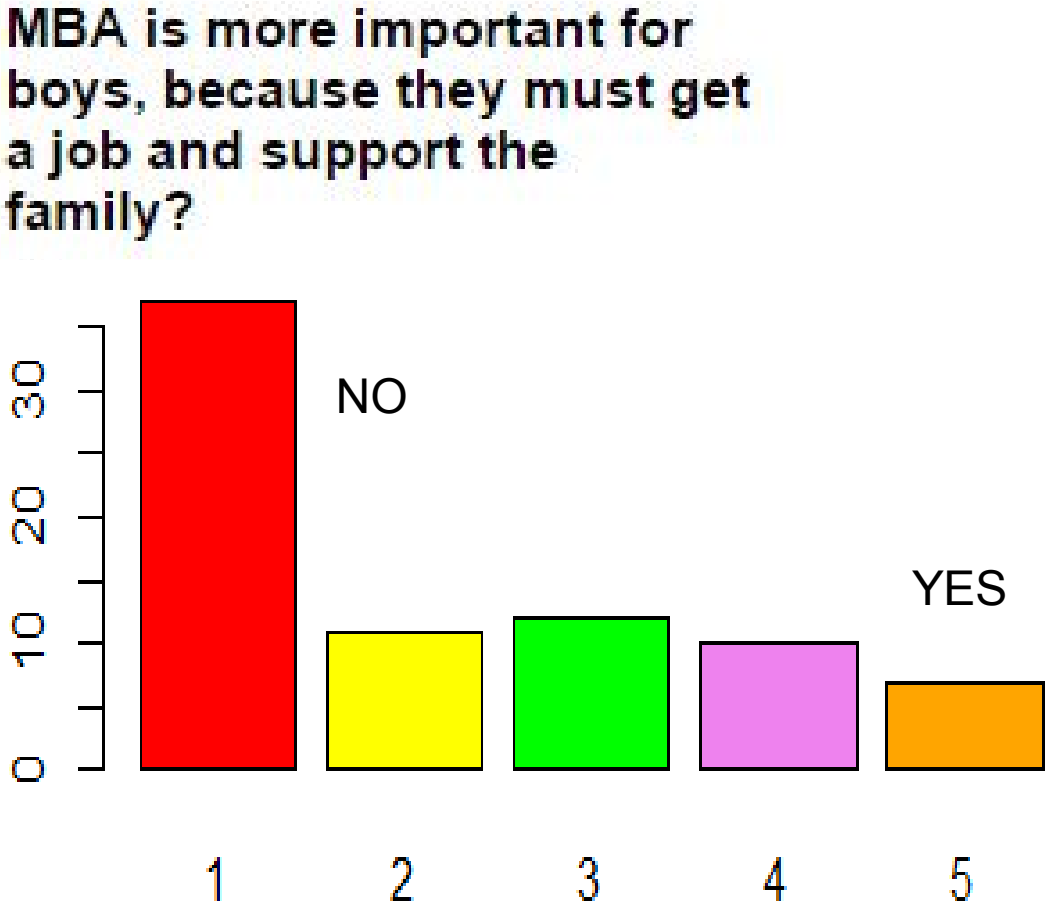
Boy	47	59%
Girl	30	38%

Q04. Should a boy offer a seat to a girl?



1	9	11%
2	7	9%
3	23	29%
4	12	15%
5	27	34%

Q05. MBA is more important for boys?



1	37	47%
2	12	15%
3	12	15%
4	10	13%
5	7	9%

Q06. Boys are better Math?

1	12	15%
2	10	13%
3	51	65%
4	5	6%
5	1	1%

Comparison of Gender Opinions with t-tests

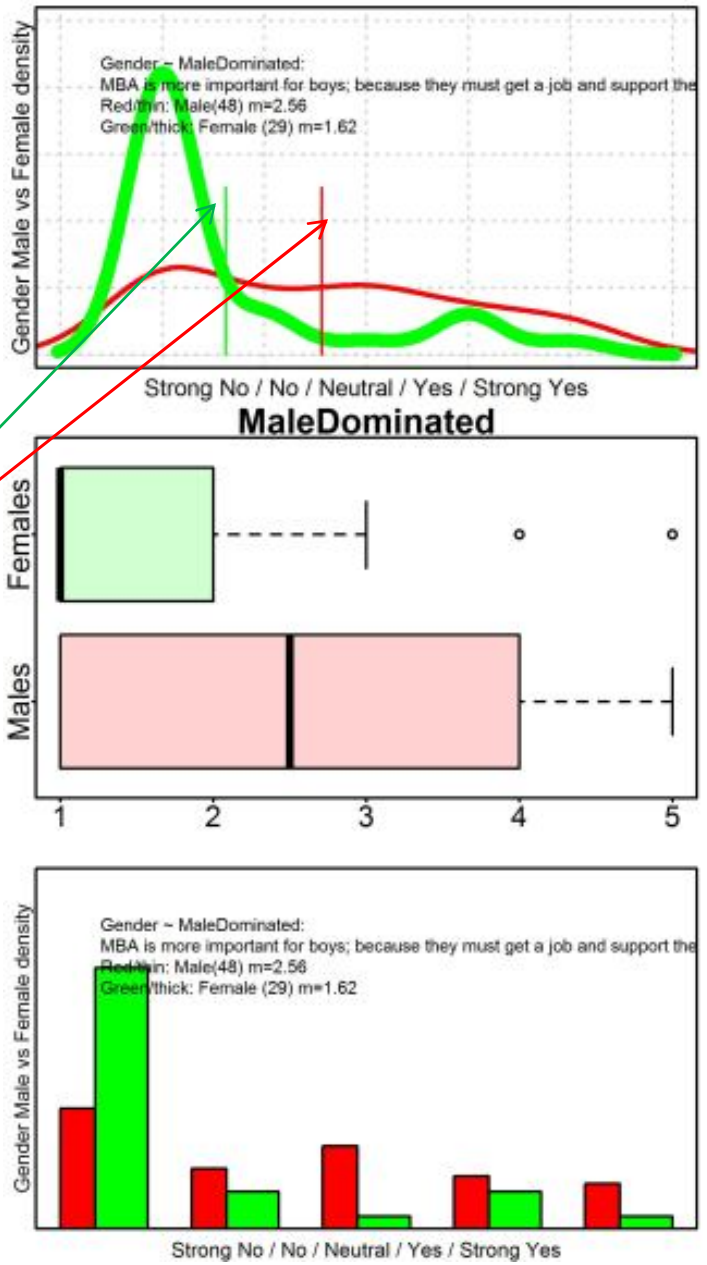
- We found 8 questions where male and female differed (graphs in next slide), In summary:
- The females are more from small town rural area, vernacular background, feel more strongly about gender equality, they write more, but less likely to read online news, and lack of future entrepreneur plans compared to boys.

- We used Welch's t-test, looking for difference in means between male and female with p value < 0.05, 95% confidence interval.

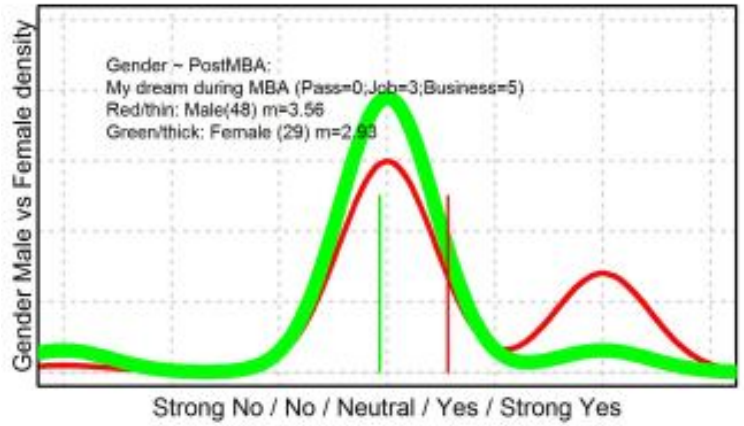
Example of Comparative Opinions 1

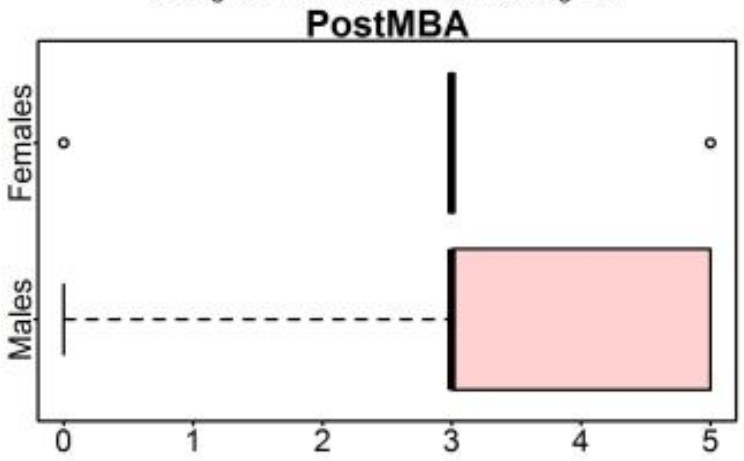
Question. *"MBA is more important for boys"*

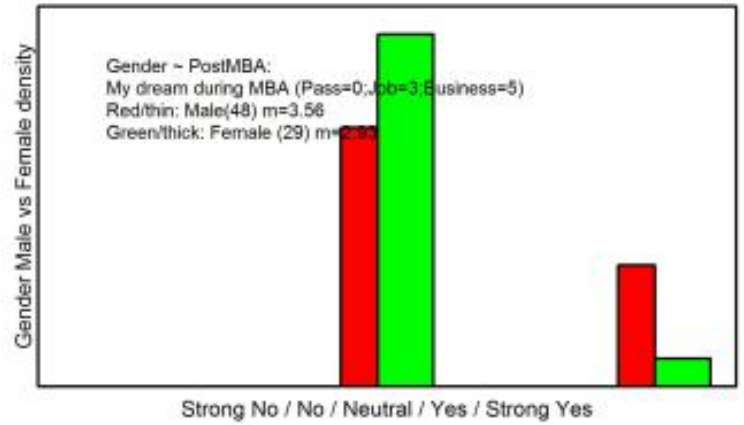
1. Red: 48 males opinion.
2. Green: 29 females opinion.
3. The t-test found Gender opinions differed significantly (pvalue<0.05 at 95%).
4. Most females said "Strong NO" (mean=1.62) to this question, compared to the boys (mean=2.56), on the question "MBA is more important for boys (Male-Dominated).



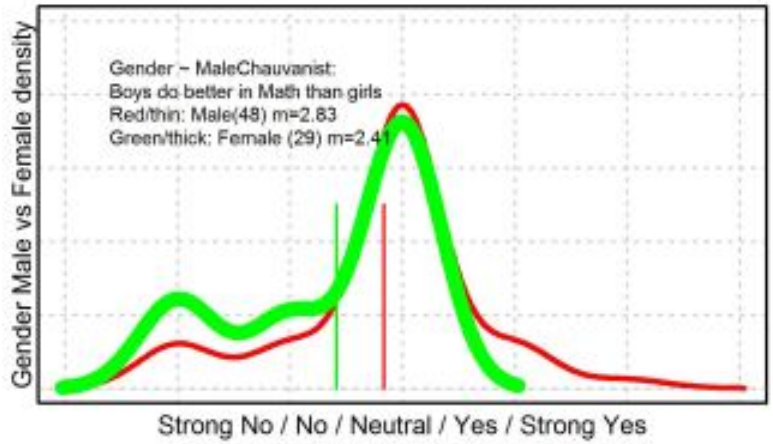
Comparative opinions: Entrepreneurship Ambitions?

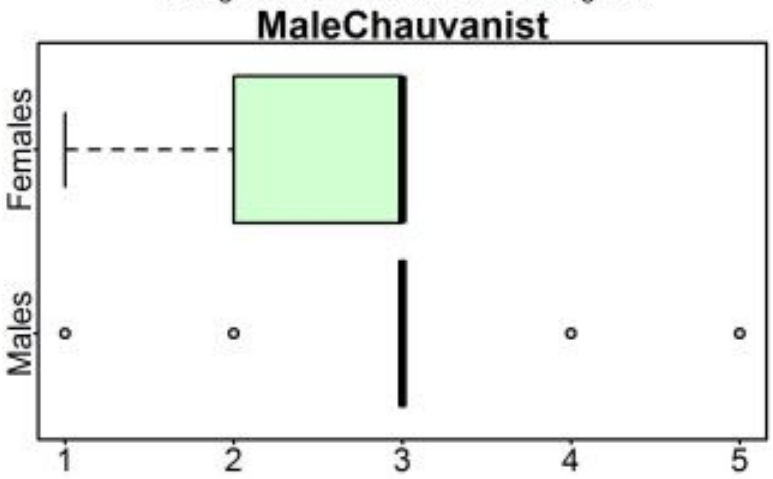


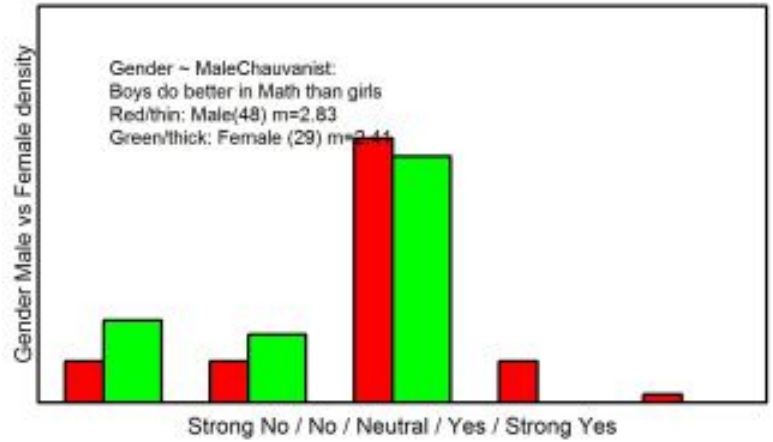




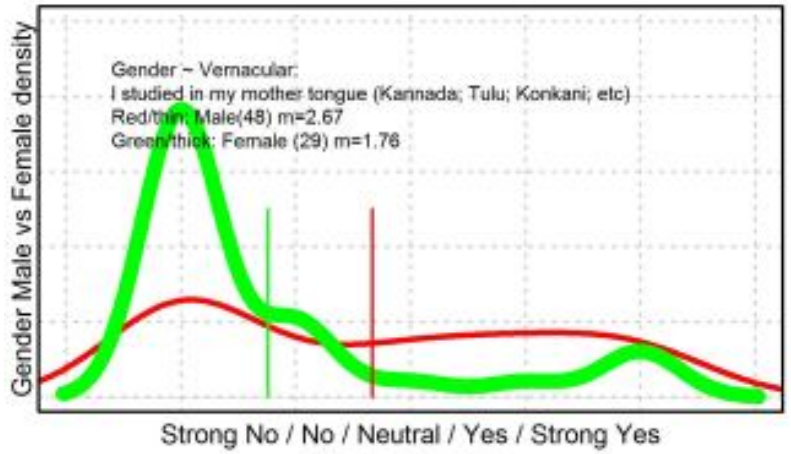
Comparative opinions: Boys better at Math?

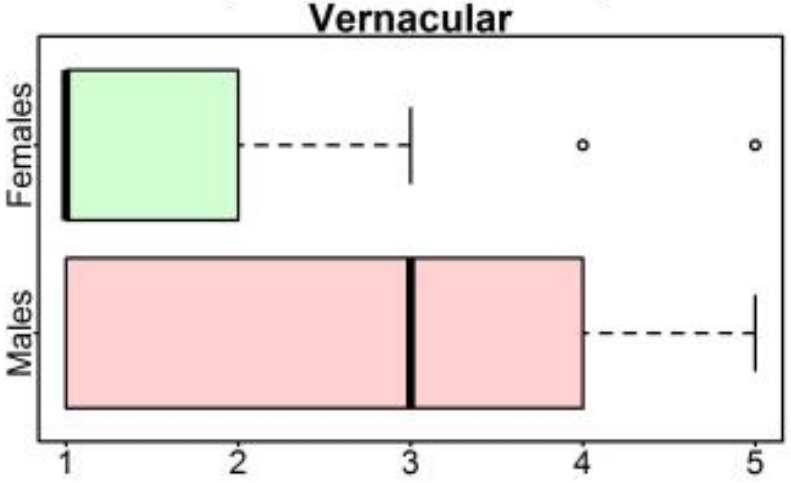


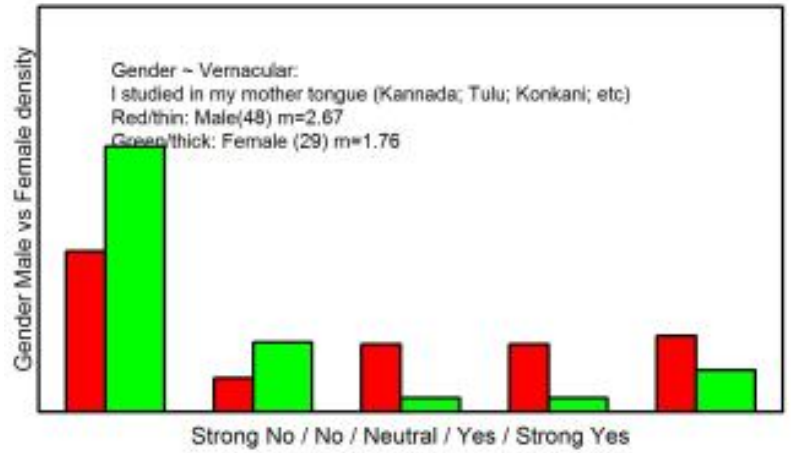




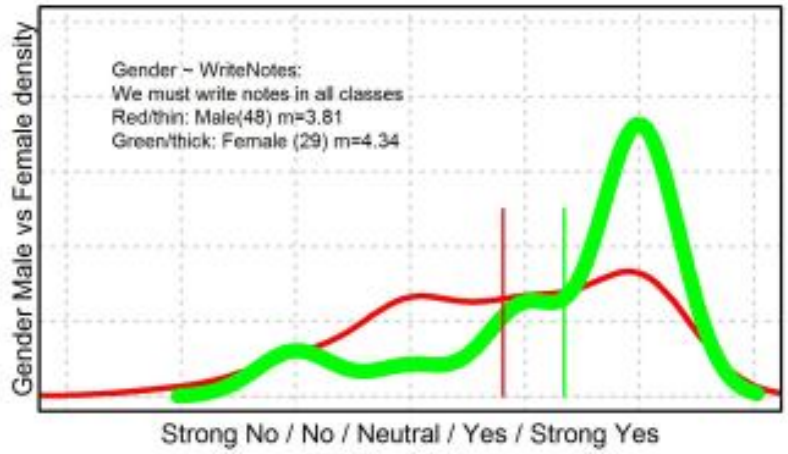
Comparative opinions: Studied in Local language?

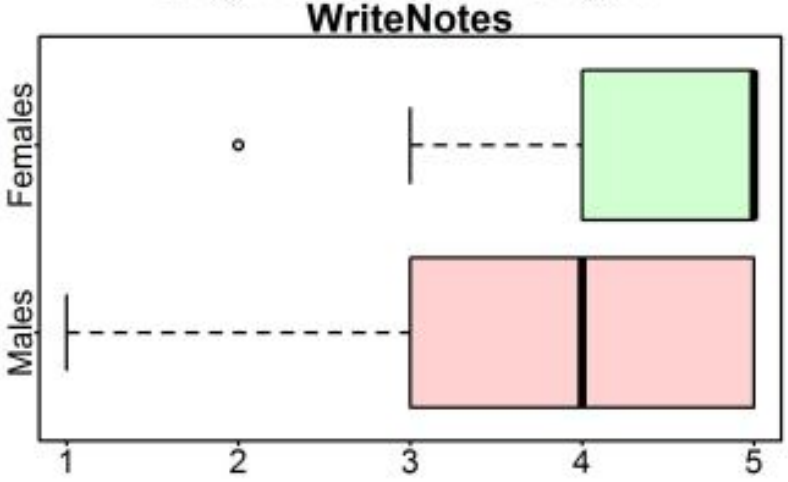


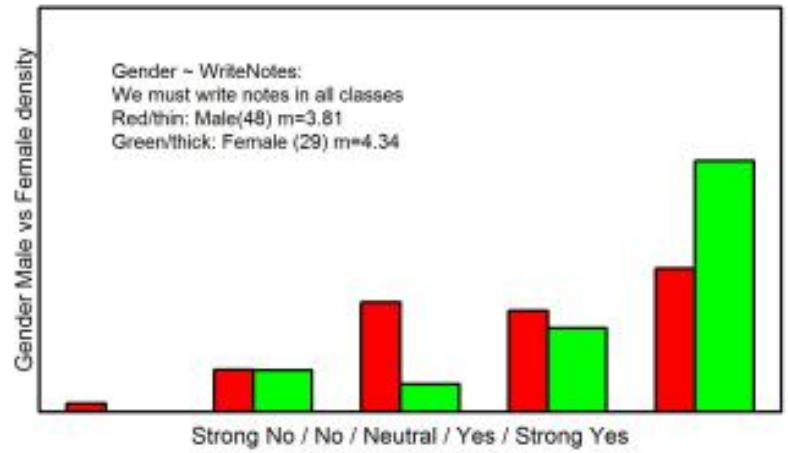




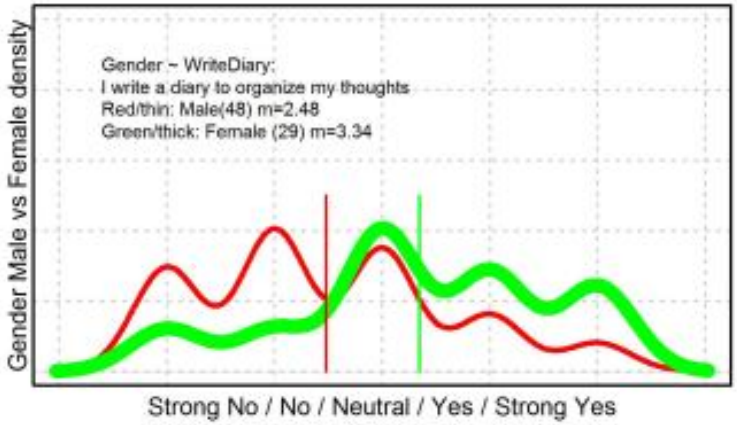
Comparative opinions: Write notes in class?

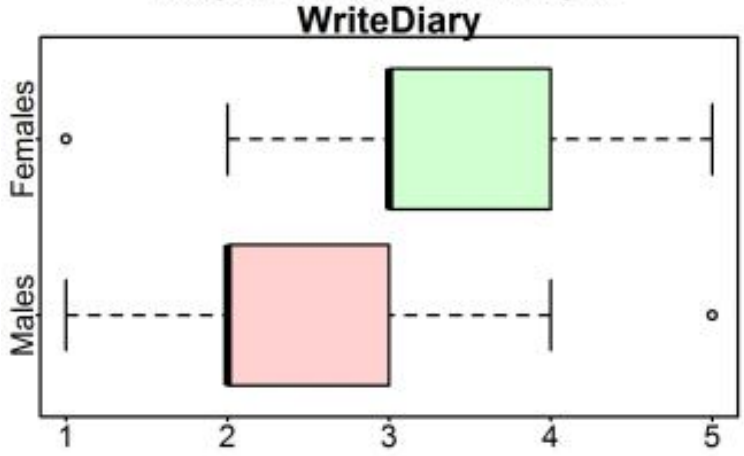


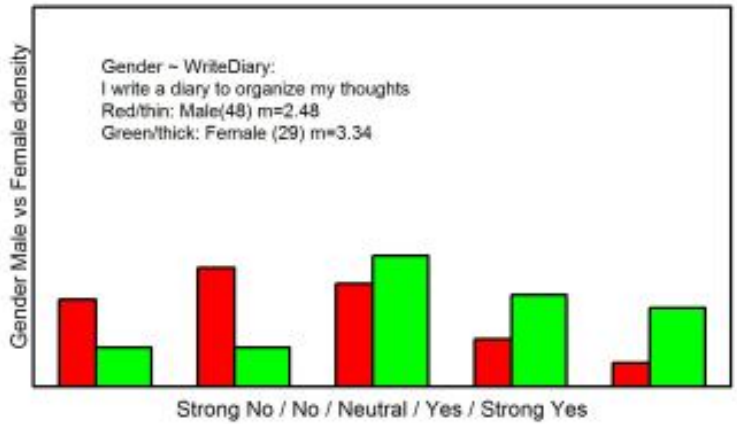




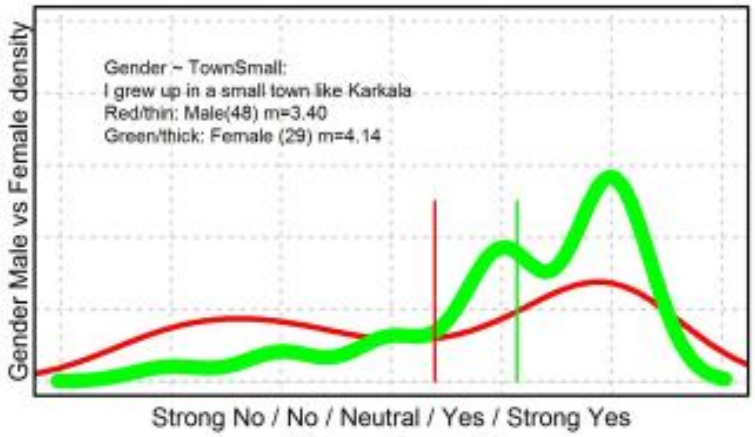
Comparative opinions: Write Diary to organize thoughts?

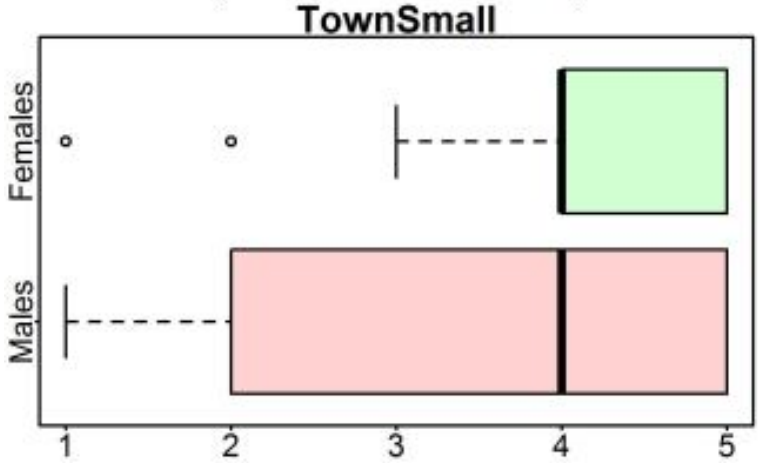


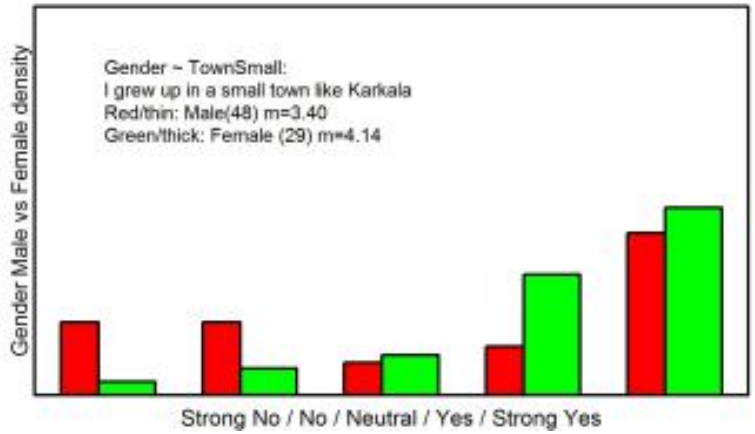




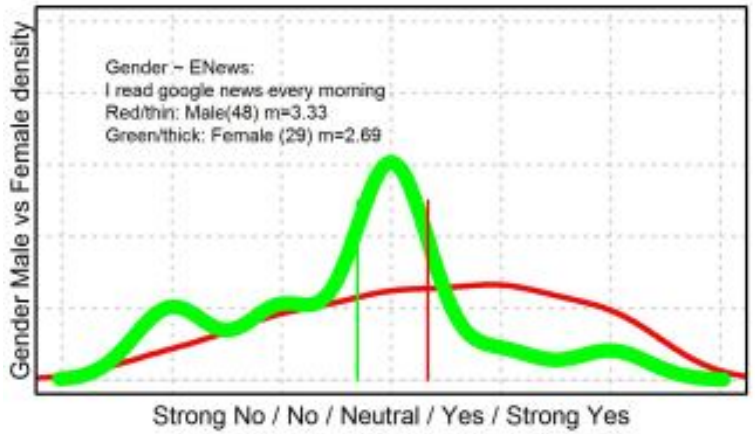
Comparative opinions: Grew up in small town?

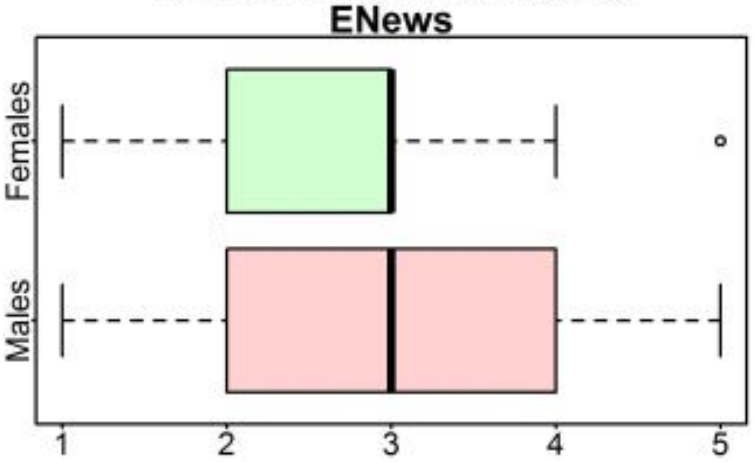


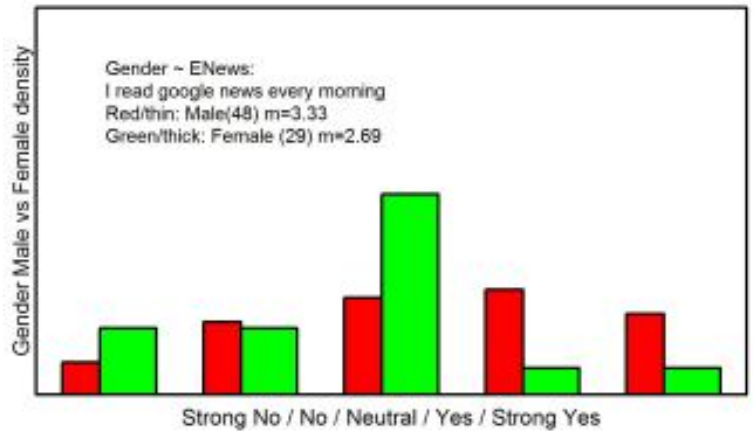




Comparative opinions: Read online news daily?







Correlations

We compute the correlations of the 4 gender answers with all the other learning factors, and present the top positive and negative correlations, along with our (possible) explanations.

1. Gender

[Gender] Girls write diaries, grew up in small towns, write notes in classes, prefer external exams to internal exams, don't think MBA is more important for boys (only), have entrepreneurship dreams after MBA, studied in English, don't read E-News in the morning, don't believe boys do better in math than the girls.

1. Gender

X = Gender: (Girl=1,Boy=0)

Positive + Girls

+0.336 WriteDiary - I write a diary to organize my thoughts

+0.244 TownSmall - I grew up in a small town like Karkala

+0.237 WriteNotes - We must write notes in all classes

+0.219 ExamExt - External exams are better than internal exams?

Negative - Boys

-0.328 MaleDominated - MBA is more important for boys ..

-0.288 PostMBA - My dream during MBA (1=pass mba, 3=good job, 5=start business)

-0.285 Vernacular - I studied in my mother tongue (Kannada; Tulu; Konkani; etc)

-0.258 ENews - I read google news every morning

-0.241 MaleChauvanist - Boys do better in Math than girls

2. Chivalry

Chivalrous students, listen more than speak English, read E-News in the morning, read comics to improve their comprehension, like big classes, don’t like to be more liberal, prefer to study on weekends also, are unhappy with MBA, don’t have true friends in college, and don’t read late into the night.

2. Chivalry

X = Chivalry: In a full bus; a boy should give seat to a girl standing?

Positive +

+0.317 Listening - Listening is more important than speaking English

+0.267 ENews - I read google news every morning

+0.248 ReadComics - Reading comics helps in MBA comprehension

+0.234 ClassBig - I like big classes

Negative --

-0.1959 Conservative - Our college needs to be more liberal

-0.1957 BigWeekend - Saturdays should be holiday so we can go home

-0.1420 MBAHappy - MBA classes give me joy and hope

-0.0989 FriendsTrue - College friends are true friends

-0.0902 SleepRead - I sleep late and read at night

3. Male Bias

[Male Dominated] Students who believe MBA is more important for boys, also studied in vernacular languages, expect the college to get them a job, prefer bigger classes, and believe boys are better at Math than girls, don’t like to learn English Literature, mostly boys, who don’t like to ask questions in class, dress in old fashion, don’t like to debate after seminars.

3. Male Bias

X= Male Bias: MBA is more important for boys;
because they must get a job and support the family?

Positive +

+0.284 Vernacular - I studied in my mother tongue (Kannada; Tulu; Konkani; etc)
+0.263 JobByCollege - It is the college's responsibility to do placements.
+0.258 ClassBig - I like big classes
+0.246 MaleChauvanist - Boys do better in Math than girls

Negative --

-0.331 EngLit - English Literature should be taught in MBA
-0.328 Gender - My gender (Girl=1,Boy=0)
-0.273 Inquisitive - We should ask more questions in class
-0.237 OldDrs - Dress code in college is old fashioned
-0.235 Debate - Seminars must include debate at the end

4. Male Bias

[Male Bias] We notice that students, who believe boys do better in math, have things to do outside of college, believe MBA is more important to boys, don’t speak English as much as listen, and stay up late. don’t study in a group, don’t meditate, whose parents are not proud of them, and lack true friends in college.

4. MaleChauvinism

X= MaleChauvanist: Boys do better in Math than girls

Positive +

+0.278 Hobbies - I have hobbies outside of studies to keep me busy

+0.246 Listening - Listening is more important than speaking English

+0.246 MaleDominated - MBA is more important for boys;..

+0.209 SleepRead - I sleep late and read at night

Negative --

-0.241 Gender - My gender (Boy=0,Girl=1)

-0.179 ProudParent - My parents are more proud of my MBA than me.

-0.165 Meditate - I meditate to calm my mind and focus attention

-0.141 GrpStudy - I study in a group after college hours

-0.136 FriendsTrue - College friends are true friends

Caveats

1. Correlation is not causation, but with a large dataset it is a good statistical predictor.
2. Neutrals (no-opinion) also add up in correlations. In a future work, we will use more methods in R, like Carlson method.
3. We will take a larger sample and more questions.

Conclusion

1. We have correlated learning habits that go with Gender bias/equality, teachers can use the data to improve the teaching style that brings more gender Sensitivity in the classroom.
2. We have a taken a purely statistical approach to analyzing gender Sensitivity and other opinions of students.
3. We have identified several traits that good predictors of gender bias in students.
4. Colleges and companies should include regular gender sensitivity training using these indicators as guides.
5. Conversely we have found traits that go with gender sensitivity in students.

Future work

1. Correlate only the top and bottom quantiles using Carlson's method, to remove the effect of "no-opinions".
2. Include academic performance, educational background, and other demographics in the survey.
3. Survey a larger sample size.

References

1. “*R for MBA*”, Techbugs workshop, JKSHIM, NITTE, India.
2. *"A Statistical Approach to Modernize the Higher Education System"*, NITTE.
3. Google Forms for Surveys, https://www.google.com/insights/consumersurveys/home
4. SSRN paper for details.

Appendices

- R code
- Excel Data Analysis
- Survey Data
- Q&A

Survey: Plotting the data in R

```
# Read the survey data csv into R.
setwd("c:/survey")
survey <- read.csv(“survey.csv")
colors  <- c("red", "yellow", "green", "violet",
  "orange", "blue", "pink", "cyan")

# Plot the columns related to Gender
barplot(table(survey[,‘Gender']),col=colors)
barplot(table(survey[,'Chivalry']),col=colors)
barplot(table(survey[,‘MaleDominated']),col=colors)
barplot(table(survey[,‘MaleChauvanist’]),col=colors)
```

Computing Correlations in R
(using R 3.1 in R studio)

```
# Read the Google forms survey data into R.
setwd("c:/survey")
survey <- read.csv("survey.csv")
cormat <- cor(survey) # Compute Correlation Matrix

# Print the top correlated columns
for (i in 1:55 ) {
  cat(colnames(cormat)[i], ":\n");
  print("positive+\n");
  print(head(cormat[order(cormat[,i]),c(i)],5));
  print("negative-\n");
  print(head(cormat[order(-cormat[,i]),c(i)],5));
}
```

Factor Analysis in Excel

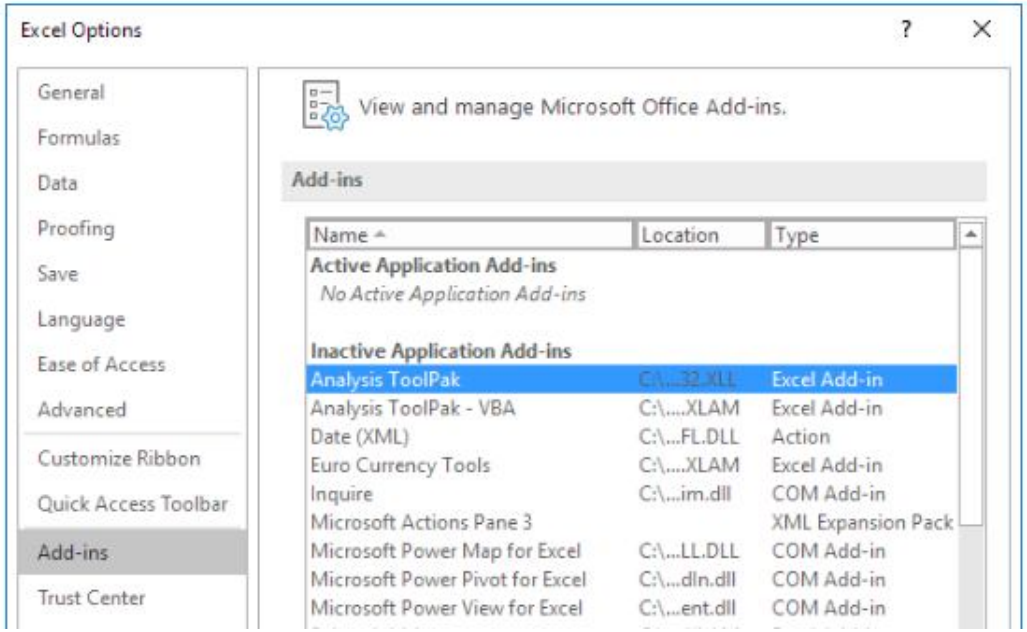
Analysis ToolPak in Excel

The Analysis ToolPak is an Excel add-in program that provides data analysis tools for financial, statistical and engineering data analysis.

To load the Analysis ToolPak add-in, execute the following steps.

1. On the File tab, click Options.

2. Under Add-ins, select Analysis ToolPak and click on the Go button.



https://www.excel-easy.com/data-analysis/analysis-toolpak.html

t-test in Excel

(t-test is used to test the null hypothesis that the means of two populations are equal.)

t-Test in Excel

This example teaches you how to perform a t-Test in Excel. The t-Test is used to test the null hypothesis that the means of two populations are equal.

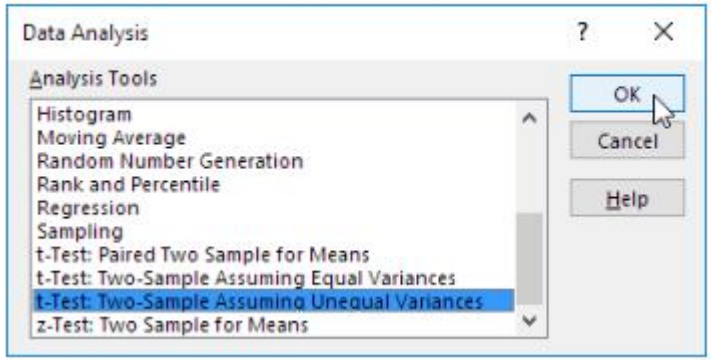
Below you can find the study hours of 6 female students and 5 male students.

H_0: $\mu_1 - \mu_2 = 0$

H_1: $\mu_1 - \mu_2 \neq 0$

	A	B	C
1	Female	Male	
2	26	23	
3	25	30	
4	43	18	
5	34	25	
6	18	28	
7	52		
8			

3. Select t-Test: Two-Sample Assuming Unequal Variances and click OK.



Result:

E	F	G
t-Test: Two-Sample Assuming Unequal Variances		
	Variable 1	*Variable 2*
Mean	33	24.8
Variance	160	21.7
Observations	6	5
Hypothesized Mean Difference	0	
df	7	

From https://www.excel-easy.com/examples/t-test.html

Appendix survey.csv

1. Reading,SleepRead,Confident,Chivalry,MaleDominated,MaleChauvanist,ExamMult,ExamExt,ReadComics,JobNoWorry,JobByCollege,Inquisitive,Debate,WriteNotes,ClassTooMany,BigWeekend,TeacherListen,NotMarks,GrpStudy,TeachersEq,ActivityTooMany,Conservative,TechNeeded,OldDrs,ENews,PeerPres,TeacherPest,EngLit,EnglishJob,Listening,Writing,ActivityOpt,Gender,PostMBA,ClassBig,Vernacular,TownSmall,FriendsMany,FriendsTrue,Movies,StudiesHigher,ExcelExpert,Blogger,Webpage,WriteDiary,Meditate,Hobbies,MBASad,MBAHappy,FoodHealthy,SpkEmpowered,TeacherEmpower,ProudParent,Proudl,Degree
2. 5,5,5,4,5,3,2,3,5,3,1,5,4,5,3,2,4,4,3,5,3,2,2,2,3,4,2,4,5,4,4,3,1,3,3,1,4,3,3,3,2,3,4,1,5,3,4,2,4,4,4,5,5,5,3
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Question and Answers

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