5-16-2016

GAISEing into the NEW Guidelines

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GAISEing into the NEW Guidelines

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GAISEing into the NEW Guidelines

http://www.amstat.org/education/gaise/

- Original Report
- March Webinar Recording
- Completed Report

CAUSE

JSM2015 Seattle

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Everything is the same…
but everything has changed!

Original GAISE College Report	GAISE 2016 Report
Total: 61 pages	**Total:** 139 pages
Main Report: 25 pages Five groups of Goals for Students Six Recommendations for Teaching	**Main Report:** 26 pages Nine Goals for Students Six Recommendations for Teaching
Supporting Appendices: 38 pages • Examples of Activities and Projects • Examples of Assessment Items • Example of Using Technology • Examples of Naked, Realistic, and Real Data	**Supporting Appendices:** 113 pages • Evolution of Intro Stats & Emergence of Statistics Education Resources • Multivariable Thinking • Activities, Projects, and Datasets • Examples of Using Technology • Examples of Assessment Items • Learning Environments

Two new emphases

a. **Teach statistics as an investigative process of problem-solving and decision-making.**

Statistics is a problem-solving and decision-making process, not a collection of formulas and methods.

b. **Give students experience with multivariable thinking.**

The world is a tangle of complex problems with inter-related factors. Let's show students how to explore relationships among many variables.

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What is your comfort level with multivariable thinking?

a) Very comfortable – Ready to teach it today!

b) Somewhat comfortable – Considering adding it as a new topic soon.

c) Not comfortable – Not Ready to Teach it Yet

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Your assignment!

- As we go through the next example, think about how this activity can be used in different learning environments.
  - Face to Face
  - Distance Learning (Online)
  - Flipped (Inverted)
  - Large Classes
  - Cooperative Learning
  - If you think of something, go ahead and send it as a chat message.

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Illustration from the Report: SAT Scores and Teacher Salaries (1999)

- Touches on 5 of the 6 recommendations (no Assessment today!)
- Statistical thinking experience
- Key ***concept*** in the lesson: Confounding/ lurking variable
  - *Limits of observational studies*
  - *Multivariable thinking via stratification*
- **Real data** relevant to student experience – engagement
- Interactive discussion – active learning
- Technology to convey the concept

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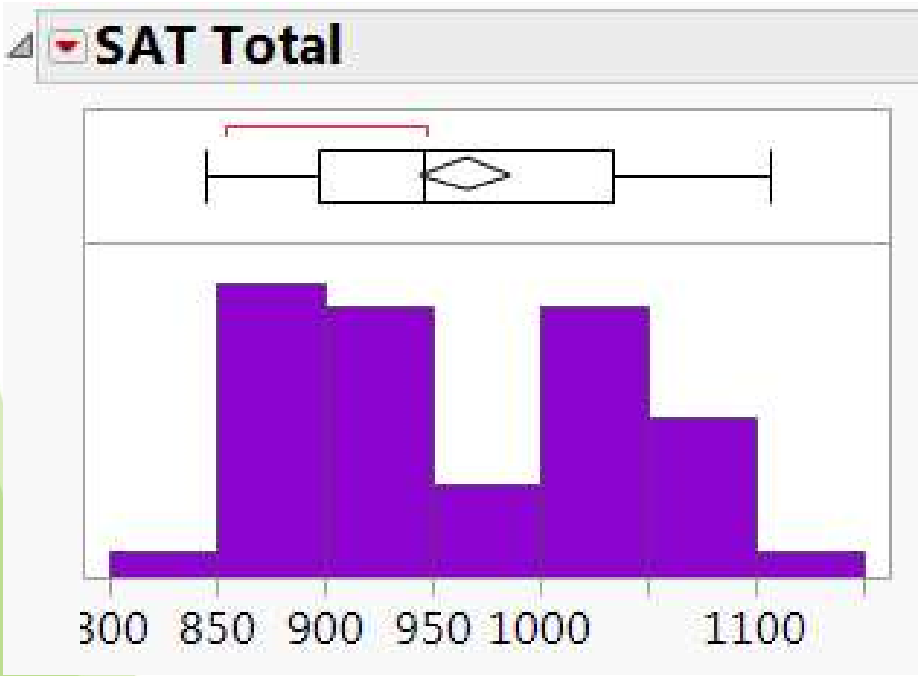
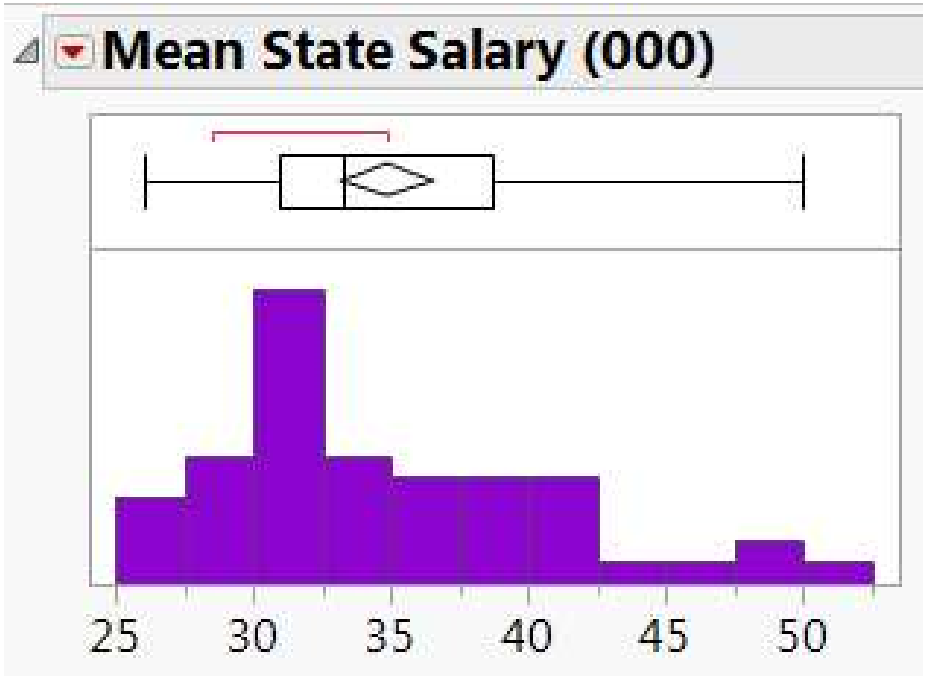
States vary widely…





What impact might we expect salaries to have on SAT scores?

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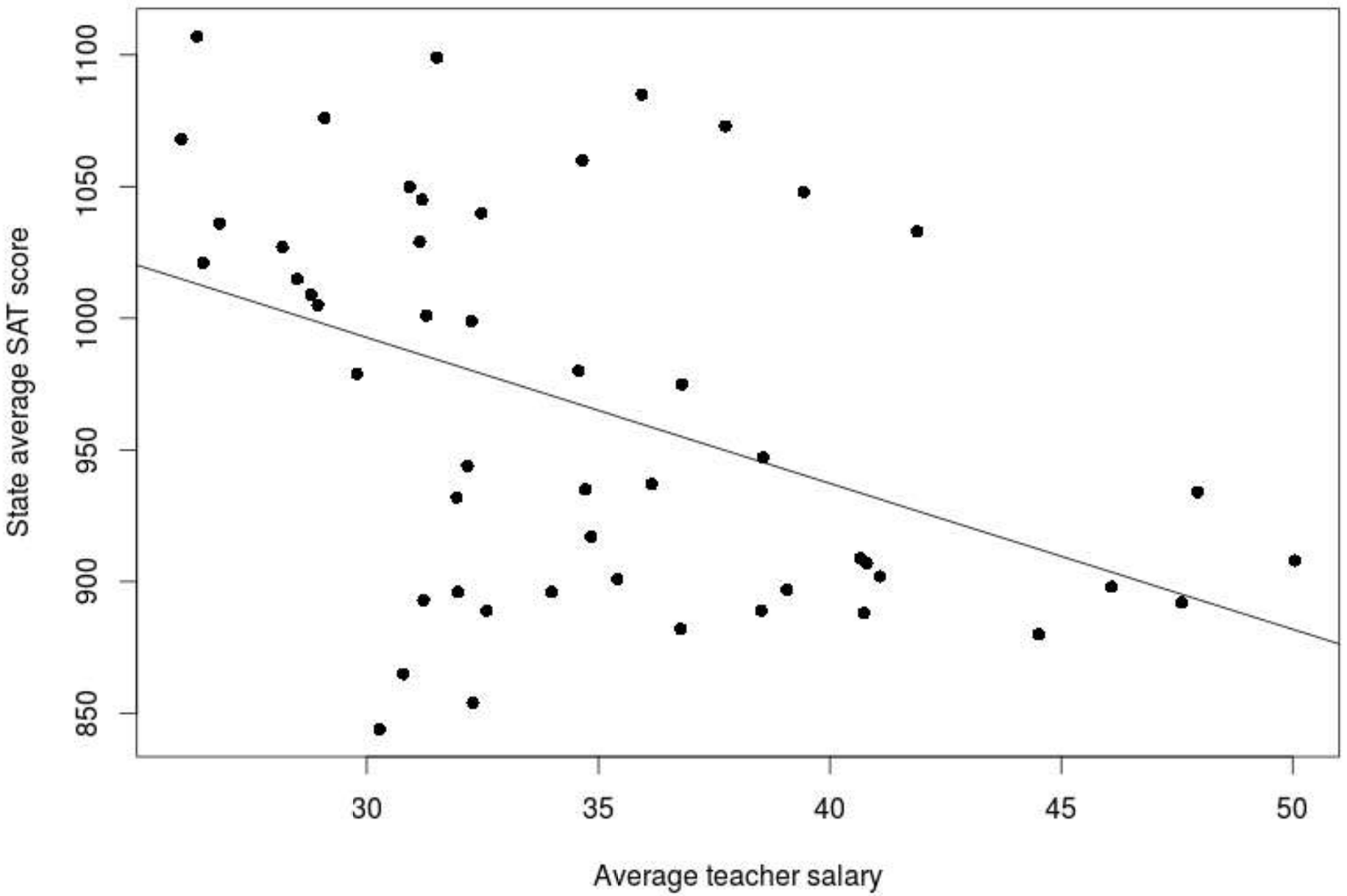
What's next?

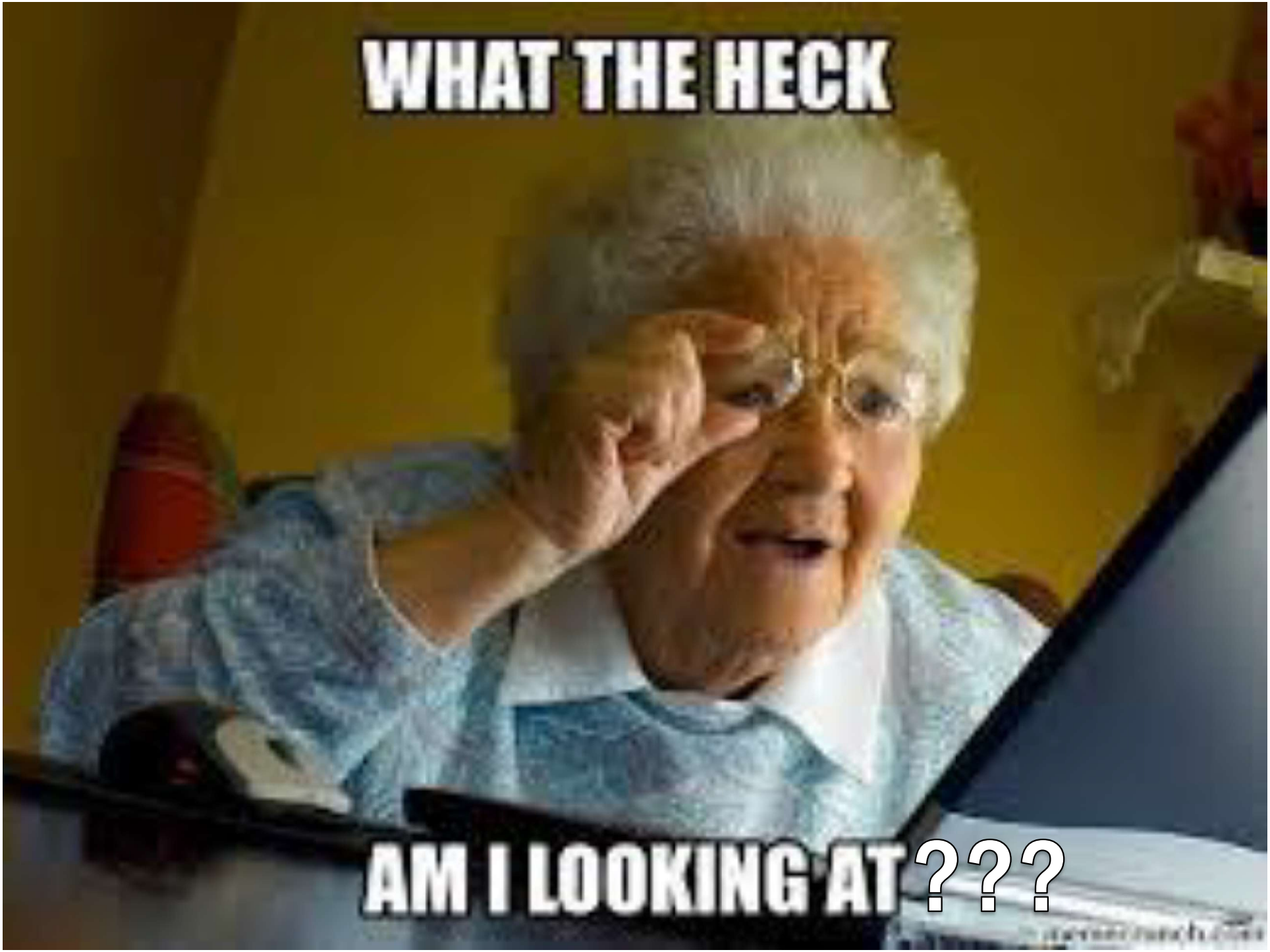
- So, we have now set the stage for our investigation.

- We are now going to go through how to do work this out using four different technology packages.
  - R
  - JMP
  - Minitab Express
  - Excel

R commands to make a first scatterplot with fitted line.

```
> plot(Mean.Total~Est.Mean.Salary, data=Guber, pch=16,
ylab="State average SAT score", xlab="Average teacher
salary")
> mod1=lm(Mean.Total~Est.Mean.Salary, data=Guber)
> summary(mod1)
> abline(mod1)
```

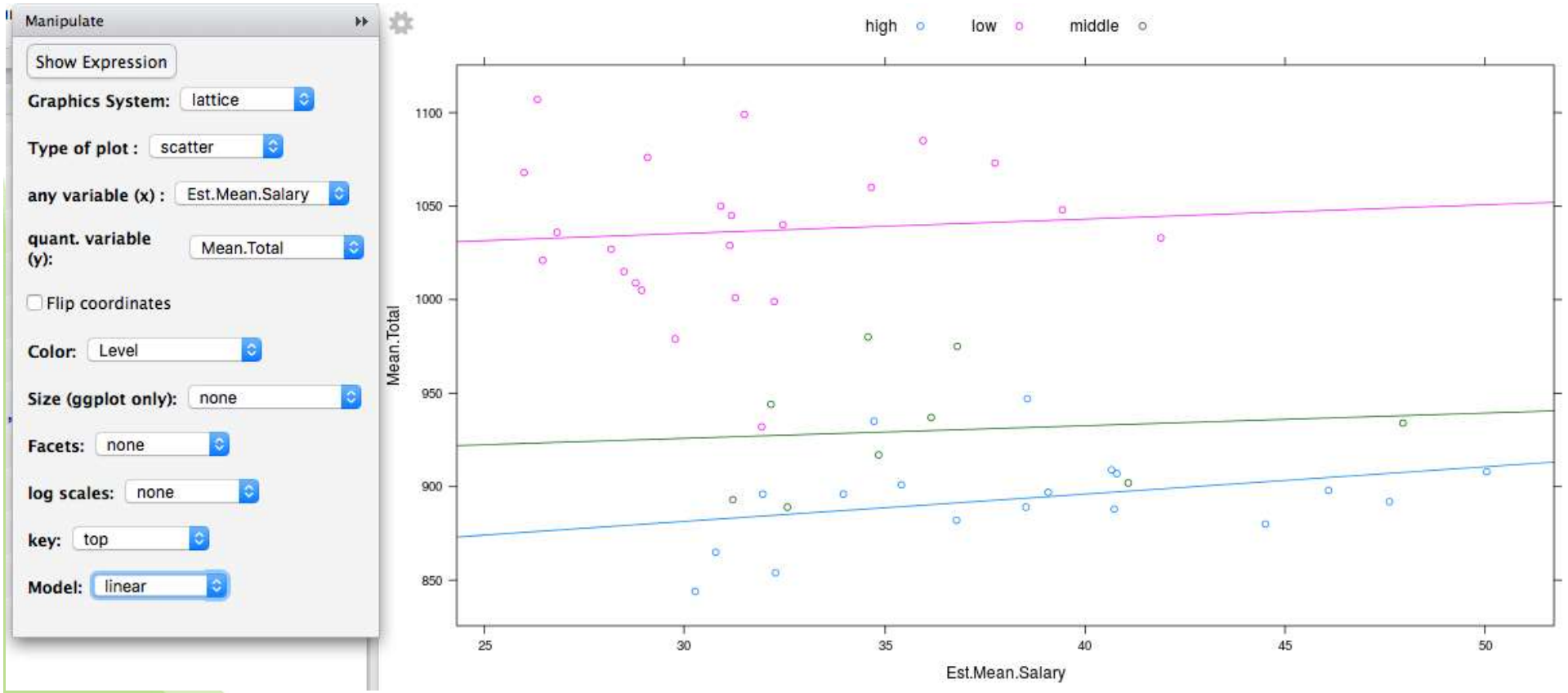

State average SAT score
850
900
950
1000
1050
1100
30
35
40
45
50
Average teacher salary


WHAT THE HECK
AM I LOOKING AT ???

R commands for the breakdown by Level

```
> #Using mosaic and lattice
> library(mosaic)
> mPlot(Guber) #then choose Selection: 2
> #then choose x and y, then color by Level, then choose Model as linear, then add a Key to the top
> #Here is what Show Expresssion gives:
> xyplot( Mean.Total ~ Est.Mean.Salary, data=Guber, groups=Level, main="", type=c("p","r"), auto.key=list(space="top", columns=3))
```

An R screenshot, using the mosaic package and mPlot()



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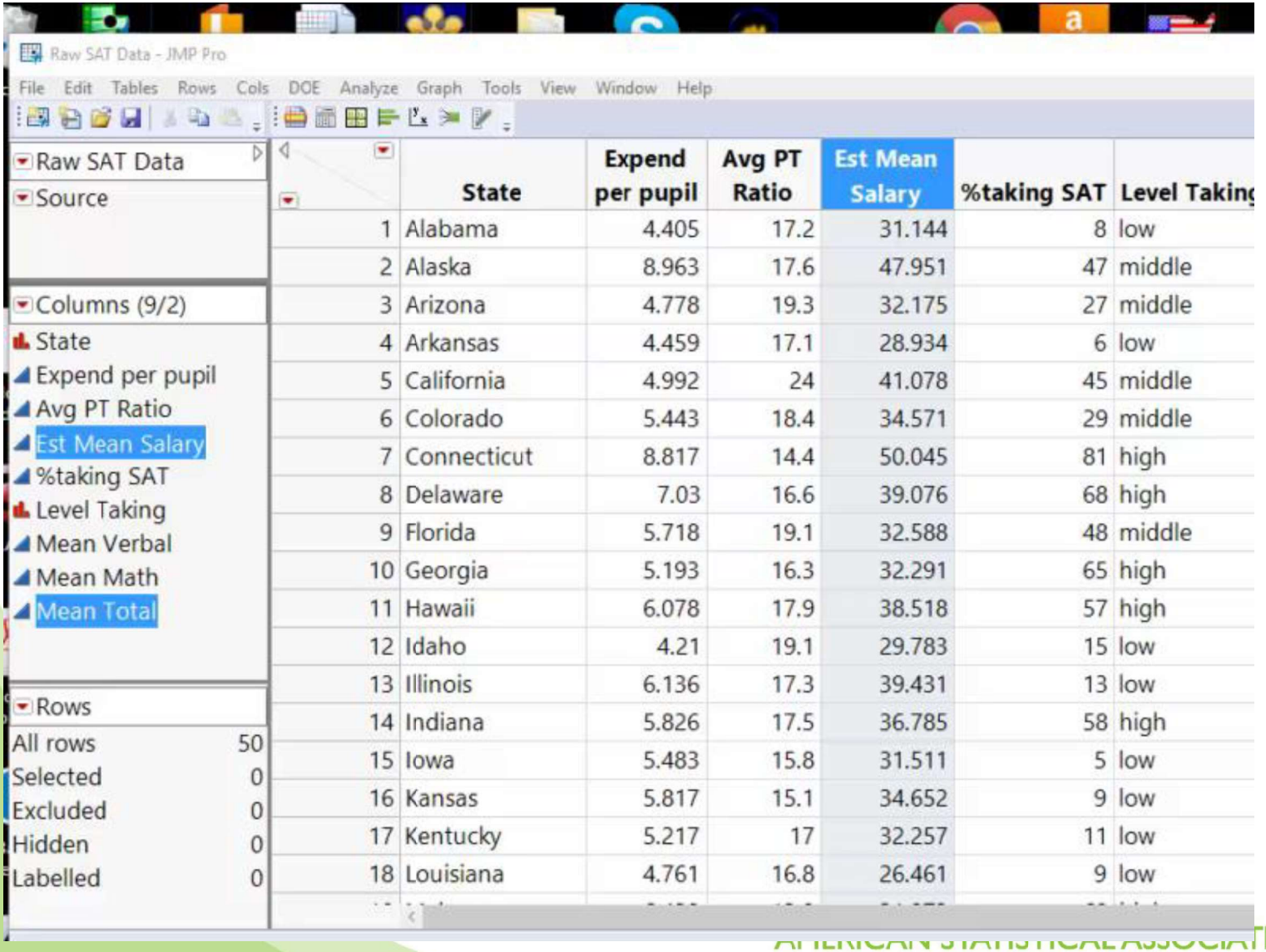
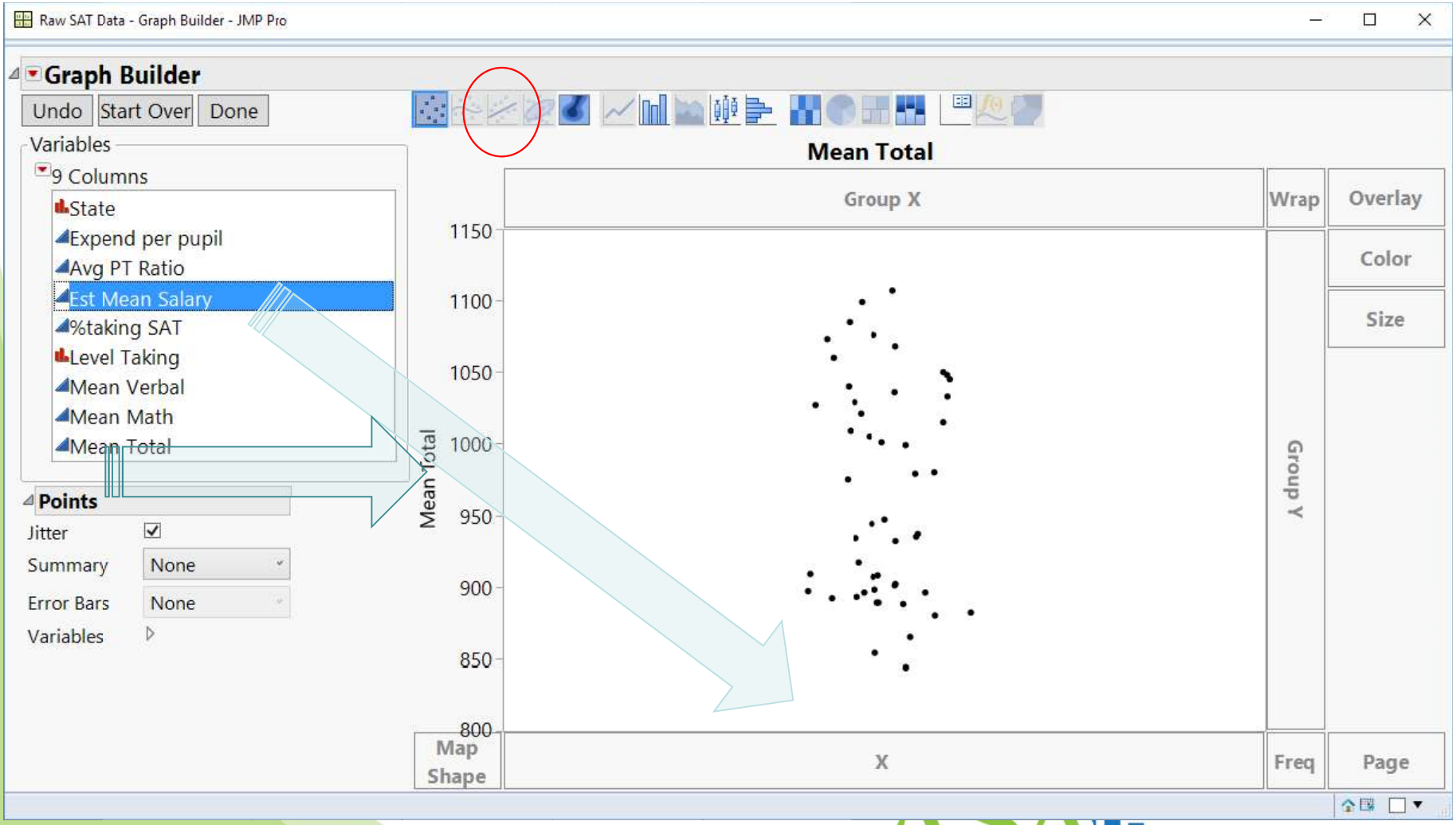
JMP Video



	State	Expend per pupil	Avg PT Ratio	Est Mean Salary	%taking SAT	Level Taking
1	Alabama	4.405	17.2	31.144	8	low
2	Alaska	8.963	17.6	47.951	47	middle
3	Arizona	4.778	19.3	32.175	27	middle
4	Arkansas	4.459	17.1	28.934	6	low
5	California	4.992	24	41.078	45	middle
6	Colorado	5.443	18.4	34.571	29	middle
7	Connecticut	8.817	14.4	50.045	81	high
8	Delaware	7.03	16.6	39.076	68	high
9	Florida	5.718	19.1	32.588	48	middle
10	Georgia	5.193	16.3	32.291	65	high
11	Hawaii	6.078	17.9	38.518	57	high
12	Idaho	4.21	19.1	29.783	15	low
13	Illinois	6.136	17.3	39.431	13	low
14	Indiana	5.826	17.5	36.785	58	high
15	Iowa	5.483	15.8	31.511	5	low
16	Kansas	5.817	15.1	34.652	9	low
17	Kentucky	5.217	17	32.257	11	low
18	Louisiana	4.761	16.8	26.461	9	low

JMP: Graph Builder



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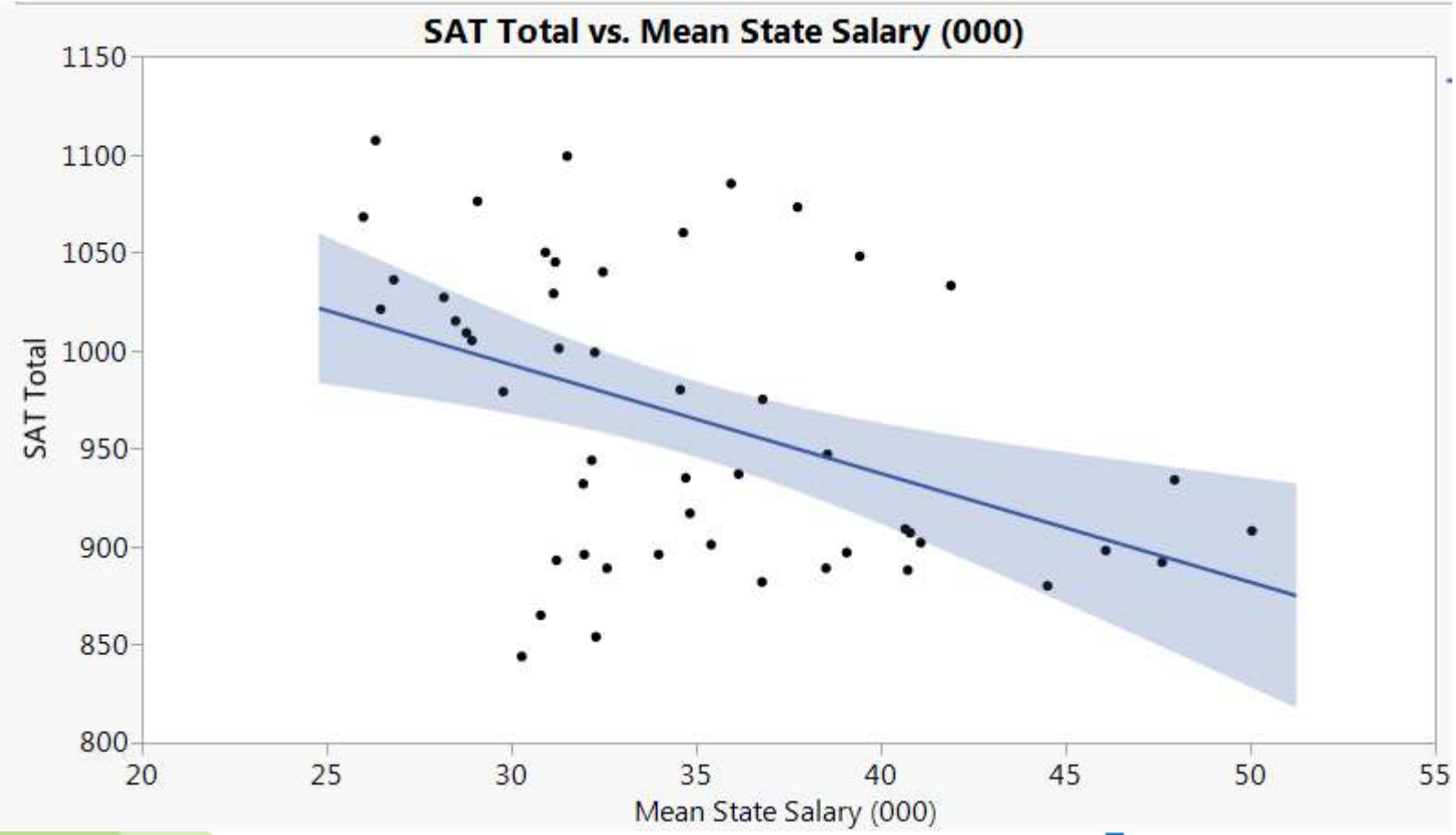
JMP: Bivariate



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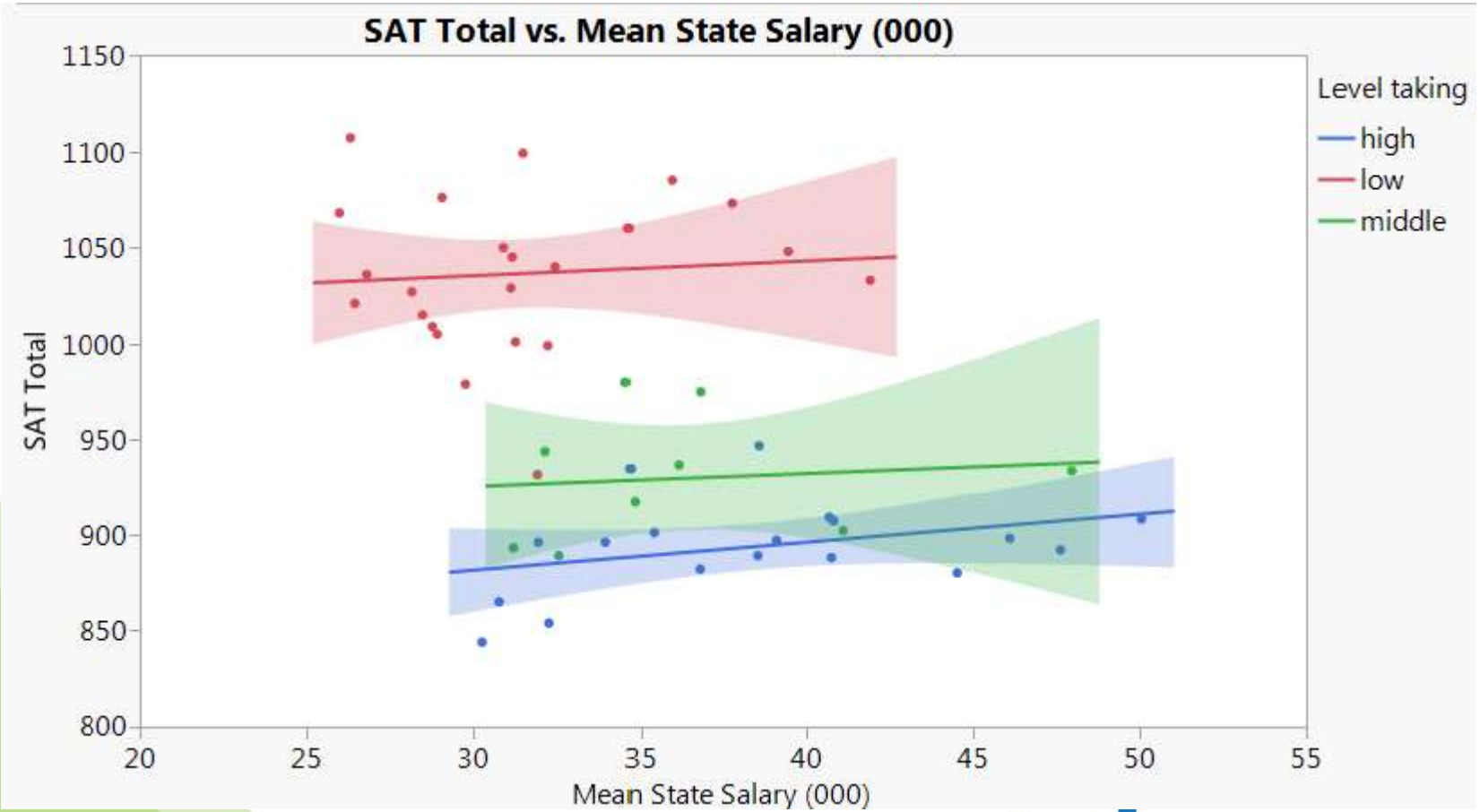
JMP (By Level)



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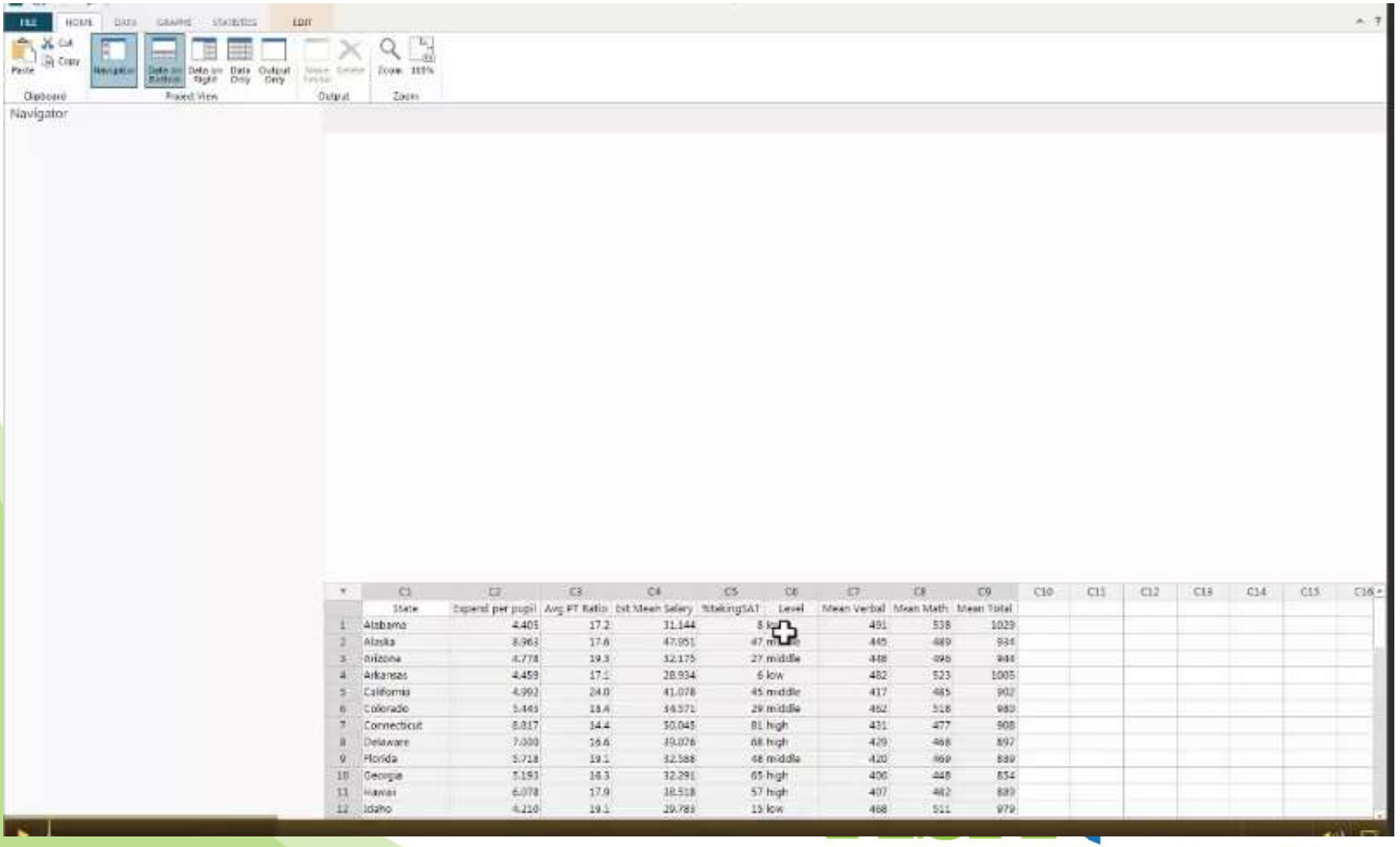
Minitab Express - Video



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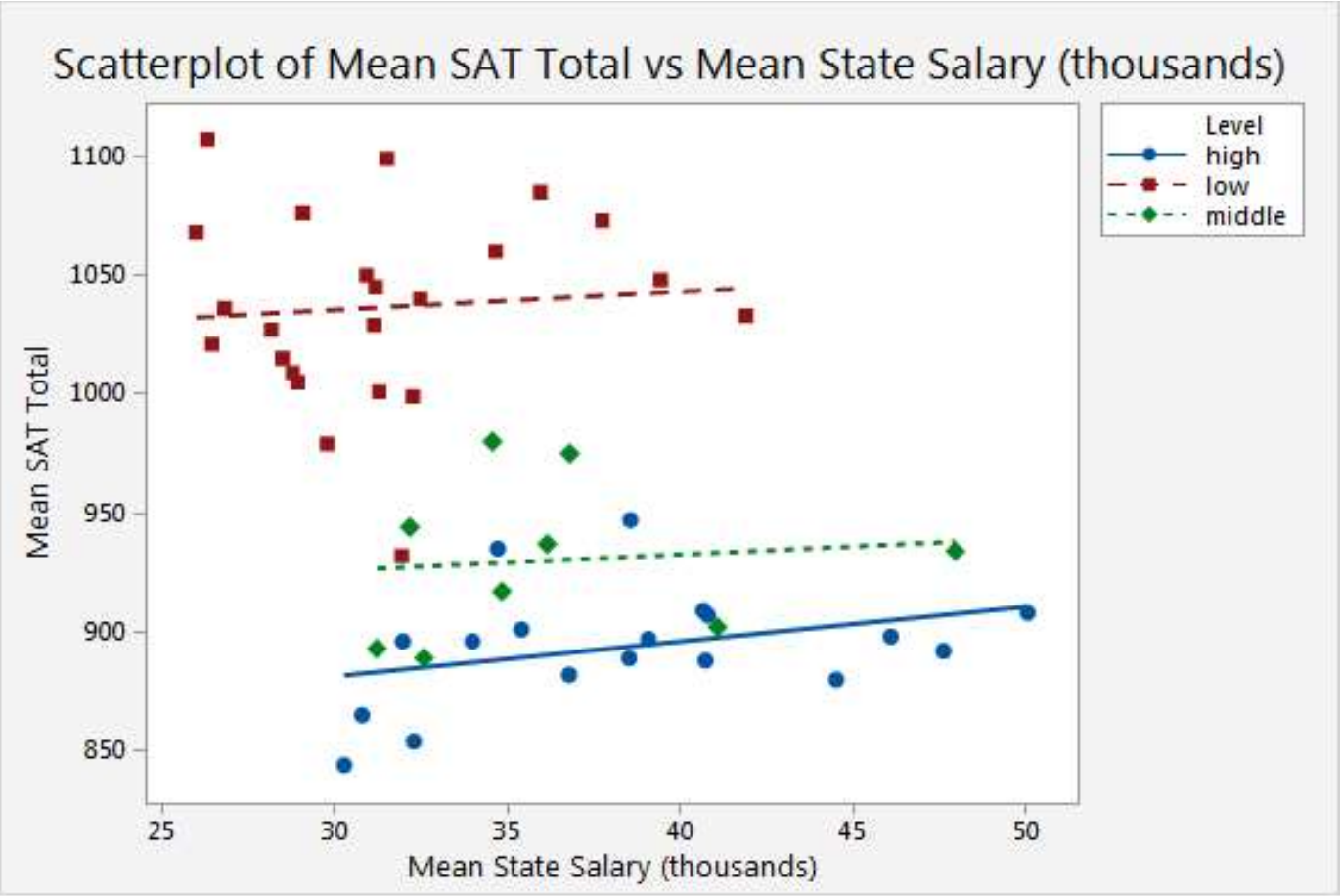
Minitab Express (Megan)



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Excel

Plate 20. UNIVAC digital computer in the U.S.A., showing a bank of magnetic-tape storage units on the right

http://worldpowersystems.com/archives/Ivall/

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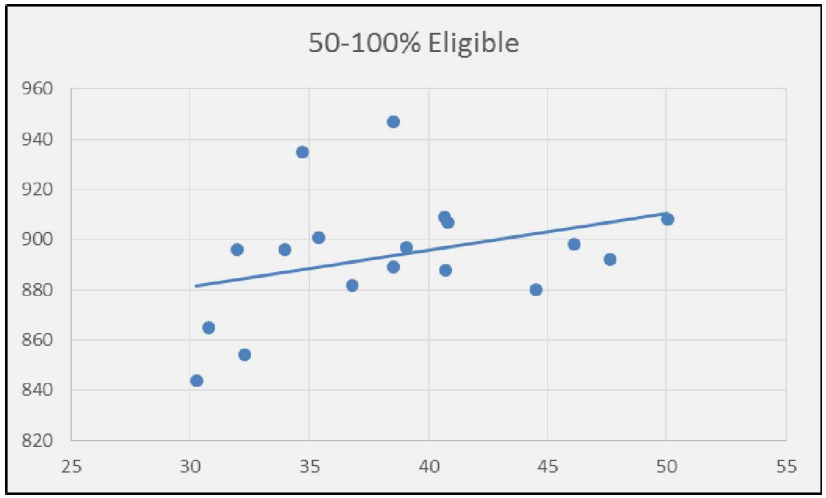
Excel (data grouping)

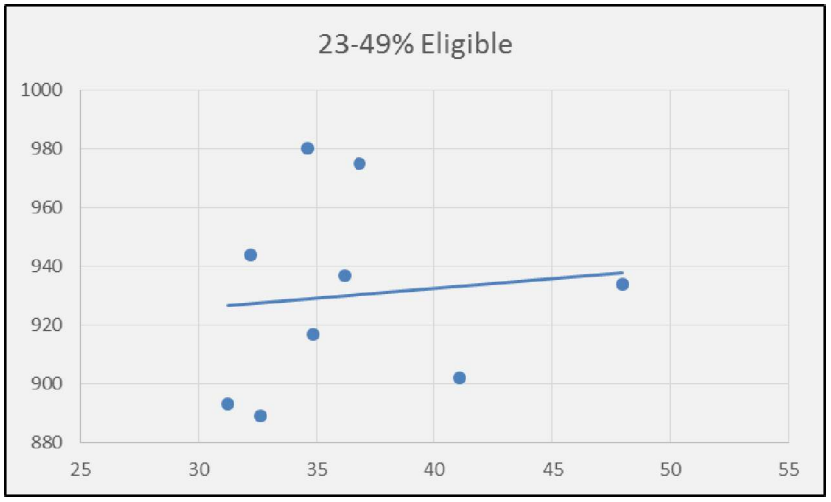
	A	B	C	D	E	F	G	H	I
1	State	Per Pupil $	Pupil/ Teacher	Salary	% eligible	Group	avg verbal	avg math	avg total
2	Alabama	4.405	17.2	31.144	8		491	538	1029
3	Alaska	8.963	17.6	47.951	47		445	489	934

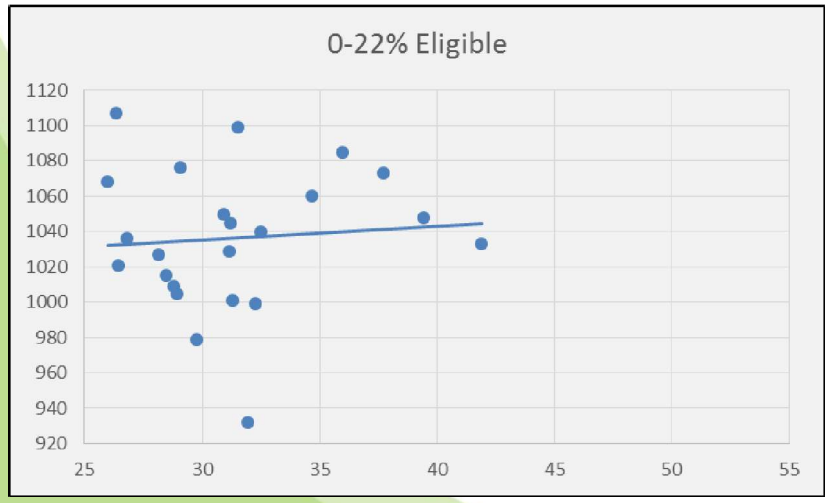
=IF(E2<22,"low",IF(E2>49,"high","medium"))

	A	B	C	D	E	F
1	State	Per Pupil $	Pupil/ Teacher	Salary	% eligible	Group
2	Alabama	4.405	17.2	31.144	8	low
3	Alaska	8.963	17.6	47.951	47	medium
4	Arizona	4.778	19.3	32.175	27	medium
5	Arkansas	4.459	17.1	28.934	6	low
6	California	4.992	24	41.078	45	medium
7	Colorado	5.443	18.4	34.571	29	medium
8	Connecticut	8.817	14.4	50.045	81	high
9	Delaware	7.03	16.6	39.076	68	high

Excel (side-by-side display)







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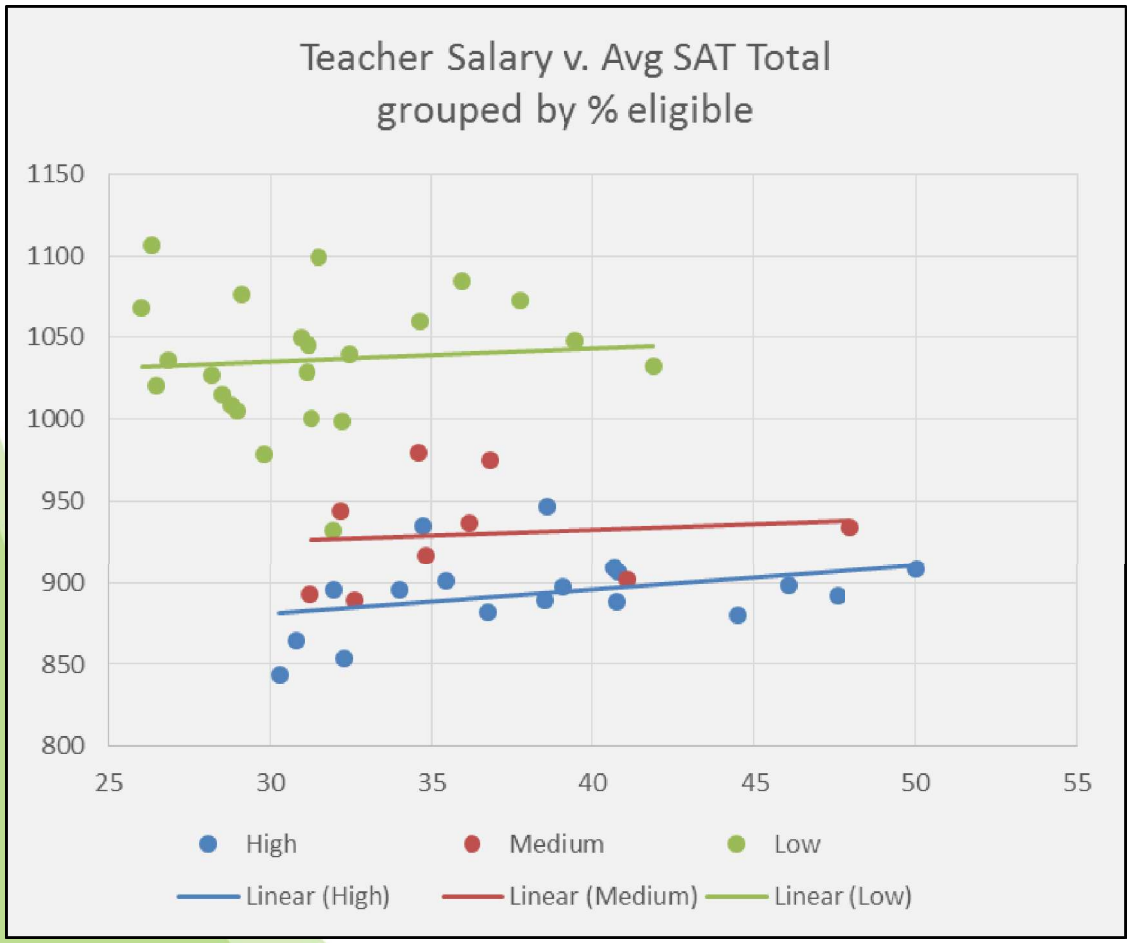
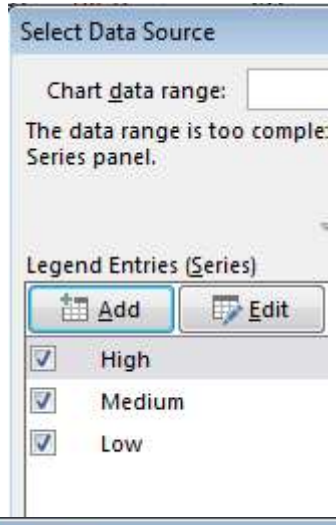
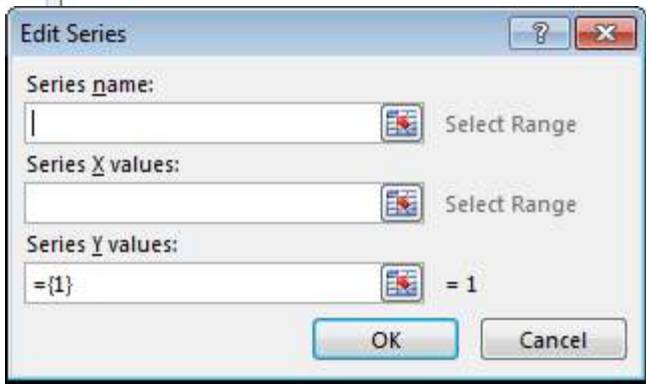
Excel (all-in-one display)







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Let's Discuss

- So, how can we use this same example in different learning environments?
  - Face to Face
  - Distance Learning (Online)
  - Flipped (Inverted)
  - Large Classes
  - Cooperative Learning

- Please enter your thoughts into the chat room.

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Interested in Learning More about GAISE 2016

- Watch the ASA webinar from March
  - http://magazine.amstat.org/videos/education_webinars/GAISECollegeWebinar3-14-16.wmv

- To read the current draft
  - http://www.amstat.org/education/gaise/

- Any questions or comments, please feel free to contact the co-chairs, Michelle Everson (everson.50@osu.edu) or Megan Mocko (mmeece@ufl.edu)

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