GAISEing into the NEW Guidelines

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GAISEing into the NEW Guidelines

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GAISEing into the NEW Guidelines

- Original Report
- March Webinar Recording
- Completed Report

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

USCOTS '15
making connections

CAUSE

ASA
AMERICAN STATISTICAL ASSOCIATION
Promoting the Practice and Profession of Statistics®
Everything is the same…
but everything has changed!

<table>
<thead>
<tr>
<th>Original GAISE College Report</th>
<th>GAISE 2016 Report</th>
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</thead>
<tbody>
<tr>
<td><strong>Total:</strong> 61 pages</td>
<td><strong>Total:</strong> 139 pages</td>
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<tr>
<td><strong>Main Report:</strong> 25 pages</td>
<td><strong>Main Report:</strong> 26 pages</td>
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<tr>
<td>Five groups of Goals for Students</td>
<td>Nine Goals for Students</td>
</tr>
<tr>
<td>Six Recommendations for Teaching</td>
<td>Six Recommendations for Teaching</td>
</tr>
<tr>
<td><strong>Supporting Appendices:</strong> 38 pages</td>
<td><strong>Supporting Appendices:</strong> 113 pages</td>
</tr>
<tr>
<td>• Examples of Activities and Projects</td>
<td>• Evolution of Intro Stats &amp; Emergence of Statistics Education Resources</td>
</tr>
<tr>
<td>• Examples of Assessment Items</td>
<td>• Multivariable Thinking</td>
</tr>
<tr>
<td>• Example of Using Technology</td>
<td>• Activities, Projects, and Datasets</td>
</tr>
<tr>
<td>• Examples of Naked, Realistic, and Real Data</td>
<td>• Examples of Using Technology</td>
</tr>
<tr>
<td></td>
<td>• Examples of Assessment Items</td>
</tr>
<tr>
<td></td>
<td>• Learning Environments</td>
</tr>
</tbody>
</table>
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.
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
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.

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

```r
> 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)
```
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 Expression 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()`
<table>
<thead>
<tr>
<th>State</th>
<th>Source</th>
<th>Expend per pupil</th>
<th>AVG PT Ratio</th>
<th>%taking SAT</th>
<th>Level Taking</th>
<th>Mean Verbal</th>
<th>Mean Math</th>
<th>Mean Total</th>
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<tr>
<td>Alabama</td>
<td>1</td>
<td>4.405</td>
<td>17.2</td>
<td>31.144</td>
<td>8 low</td>
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<td>47.951</td>
<td>47 middle</td>
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<tr>
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<td>4.778</td>
<td>19.3</td>
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<tr>
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<td>4.459</td>
<td>17.1</td>
<td>28.934</td>
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<tr>
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<td>5</td>
<td>4.992</td>
<td>24</td>
<td>41.078</td>
<td>45 middle</td>
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<tr>
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<td>5.443</td>
<td>18.4</td>
<td>34.571</td>
<td>29 middle</td>
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<tr>
<td>Connecticut</td>
<td>7</td>
<td>8.617</td>
<td>14.4</td>
<td>50.045</td>
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<tr>
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<td>7.03</td>
<td>16.6</td>
<td>39.076</td>
<td>68 high</td>
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<tr>
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<td>5.718</td>
<td>19.1</td>
<td>32.588</td>
<td>48 middle</td>
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<tr>
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<td>17.9</td>
<td>38.518</td>
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<tr>
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<tr>
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<tr>
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<tr>
<td>Louisiana</td>
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</tr>
</tbody>
</table>
JMP: Bivariate

SAT Total vs. Mean State Salary (000)

ASA
American Statistical Association
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JMP (By Level)
Minitab Express - Video
Minitab Express (Megan)

Scatterplot of Mean SAT Total vs Mean State Salary (thousands)

- Level: high, low, middle

Mean SAT Total

Mean State Salary (thousands)
=IF(E2<22, "low", IF(E2>49, "high", "medium"))
Excel (all-in-one display)
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.
Interested in Learning More about GAISE 2016

• Watch the ASA webinar from March

• 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)