

*Spring 2015*

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# Sabbatical Report

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# Sabbatical Topics of Research

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- ❖ In Spring 2015, I was on Sabbatical to look at Math M15: Introductory Statistics and hoped to answer *Three Questions*:
  - ❖ Are we preparing our students properly in prerequisites for Math M15?
  - ❖ How can we improve how we teach and what we emphasize in Math M15?
  - ❖ Are our students that need Math M15 for a “research methods” course learning what they need to learn in Math M15?



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# What did I do?

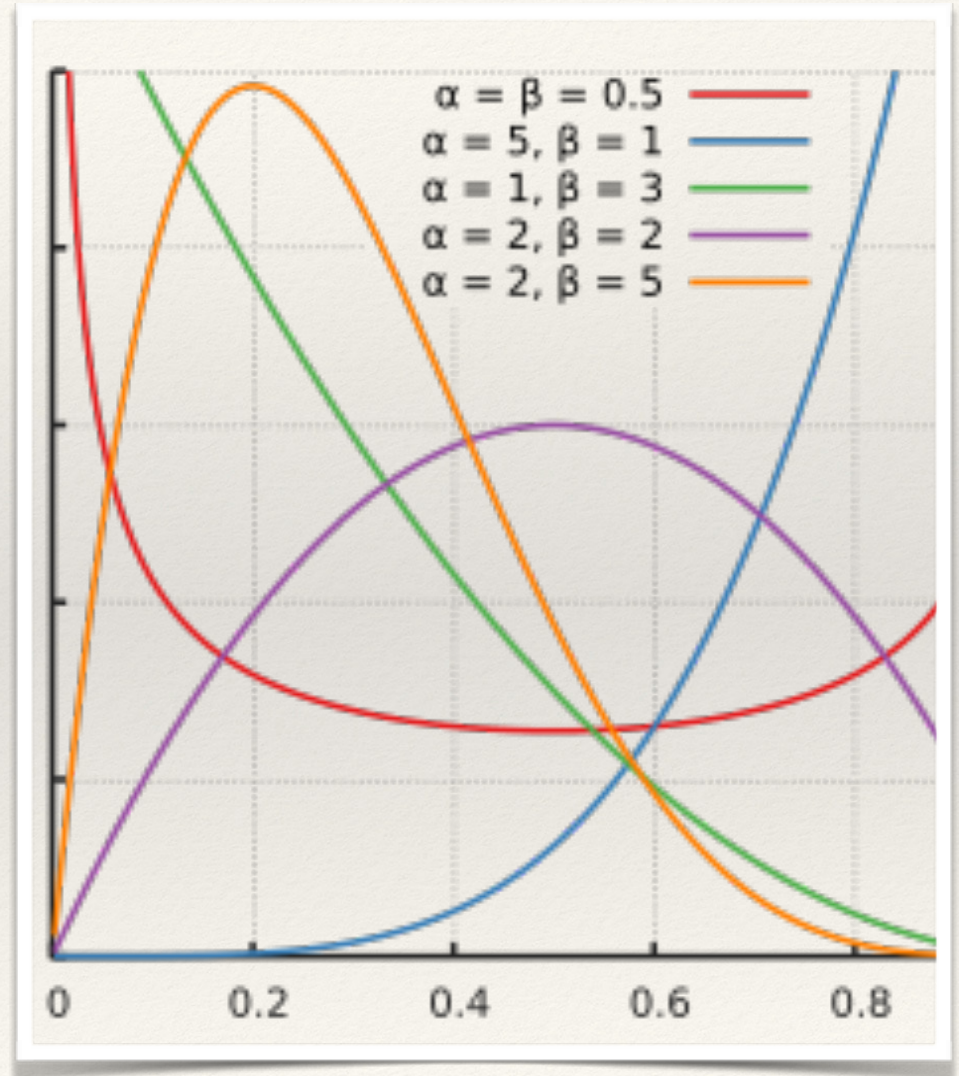
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- ❖ Two conferences where I presented on statistics
  - ❖ Edwards Bayesian Conference, CSU Fullerton
  - ❖ Mathematical Psychology Conference, UC Irvine
- ❖ Visited and / or spoke to Deans, faculty, and students from other colleges (such as Mt. Sac, Pierce, San Diego City, UCI, CSUF) about the *Three Questions*.
- ❖ Read (a lot) of statistics books.
- ❖ Most importantly had time to think about statistics!



# Sabbatical

- ❖ Reporting out
- ❖ Statway
- ❖ What can we do in the classroom immediately?





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# What is Statway

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- ❖ Statway is a propriety curriculum from the Carnegie Foundation for the Advancement of Teaching.
- ❖ The fundamental idea behind it is instead of students getting bogged down in the Math M01-Math M03-Math M15 sequence (14 units) students take a two-course sequence Statway 1 and Statway 2 (8 or 10 units) that combines algebra and statistics.
- ❖ I spoke/visited the three community colleges that offer Statway in Southern California, viz. Mt. SAC, Pierce, and San Diego City.



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# Why (and why not) Statway

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- ❖ Speaking to both faculty that have taught it, and perhaps more importantly the students in the course, they (faculty and students) believe it is a life-saver.
- ❖ It is an excellent option for those students that have tried the algebra sequence and literally failed... it gives them an option for success (50% / 70%).
- ❖ Certainly not as “rigorous” as the normal algebra sequence.
- ❖ Thus, for example, a student would likely not be able to do well in College Algebra after Statway II.



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# Why (and why not) Statway, continued

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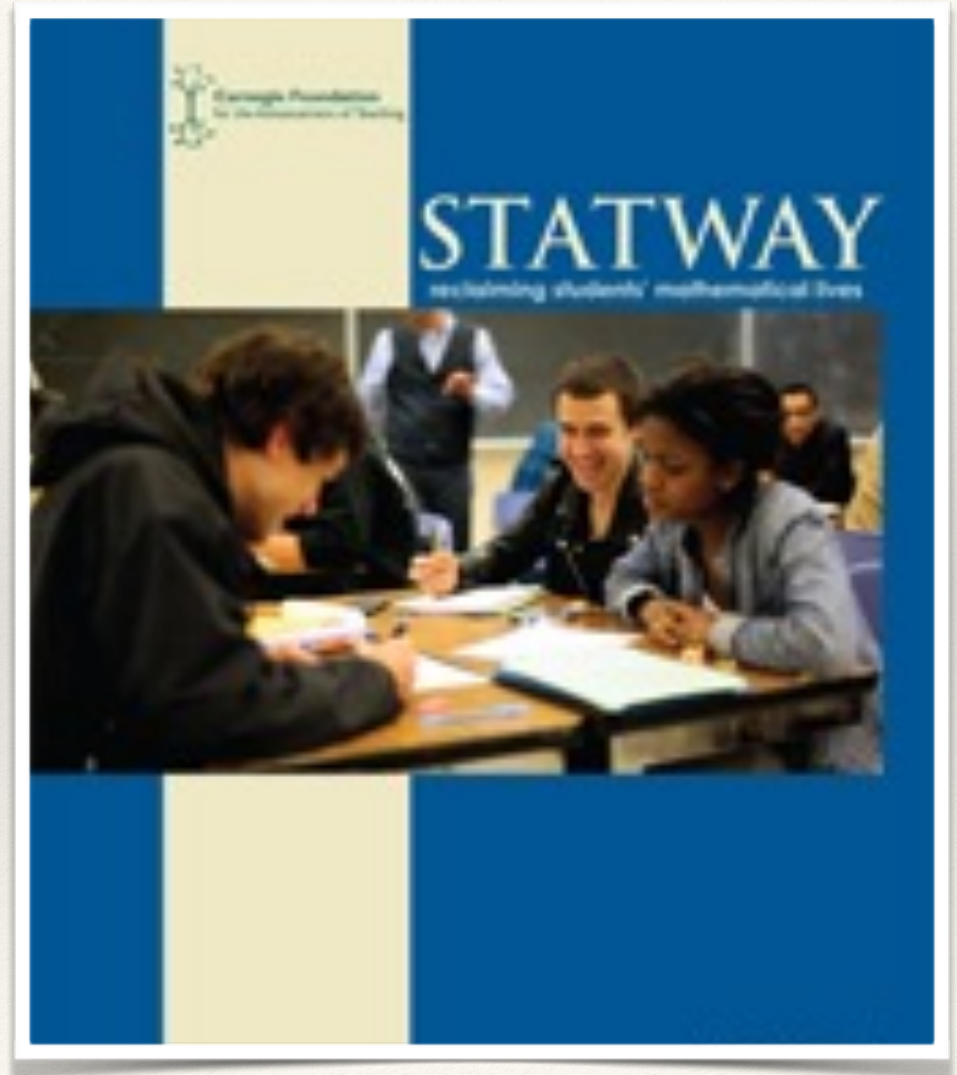
- ❖ Unfortunately, there is now a \$40,000 buy-in for the Curriculum... not sure where all of the steel money went.
- ❖ However, it has been approved by the UC for transfer, and so Cal State and C-ID will inevitably follow.
- ❖ And in fact, C-ID is currently working on it.

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# Statway Curriculum

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- ❖ The next two slides we'll look at the content of the Curriculum that is covered in Statway I and Statway II.





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# Statway I

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- ❖ Data collection
- ❖ Organizing and interpreting data graphically
- ❖ Qualitative and quantitative data sets
- ❖ Measures of central tendency & dispersion
- ❖ Bivariate data and scatter plots
- ❖ Linear and non-linear functions and their graphs
- ❖ Applying technology to various types of regression



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# Statway II

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- ❖ Review of functions and their geometric properties
- ❖ Counting principles and probability rules
- ❖ Probability distribution functions
- ❖ Sampling distributions
- ❖ Inferential statistics of one or two variable data sets



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# Accelerated Stats at Moorpark

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- ❖ I am currently (Fall 2015- Spring 2016) leading the Math Department Work Group on writing the curriculum for our own version of Statway, that is MoorparkWay!
- ❖ We hope this will roll out Fall 2017.
- ❖ Also, for Fall 2016 and Spring 2017, I plan to do a Bridge Program for Math M15 like we do now for our Algebra and Calculus classes.



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# What can we do in our classroom now?

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- ❖ When one looks at the curriculum of Statway, participates in the classes, speaks with students in the courses, and talks with faculty who teach the courses, it allows one to focus on the how and why we teach statistics, even if one is not a fan of the program itself.
- ❖ And more generally, when one researches the pedagogy of introductory statistics, we can draw some further conclusions.
  - ❖ Some of these will now follow .



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# Concepts & Computation

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- ❖ Statway, with respect to the statistics itself, covers all of the material we would expect a stats course to cover; however, it certainly emphasizes the concepts of statistics over doing the computations “by-hand” (i.e. without a graphing calculator).
- ❖ While would not to be so “extreme” in our Math M15 course, it is still important when teaching statistics to emphasize the meaning over the process.



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# The most important concepts

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- ❖ There are, naturally, a lot of concepts in statistics, and if we are desiring to be more “concept-centric,” then what concepts take precedence?
- ❖ Probability Distributions & Sampling Distributions
- ❖ Confidence Intervals
- ❖ Hypothesis Tests



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# Use of technology

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- ❖ Of all of the courses that we teach, or at least that I teach, statistics lends itself to the judicious use of technology (to include computers) very well.
- ❖ Since the use of technology (calculators or statistical software) takes care of the computations, it allows for more time to focus on the concepts, or to spend more time on a particular topics that is otherwise treated minimally.



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## Preparing those who need an upper division research methods class

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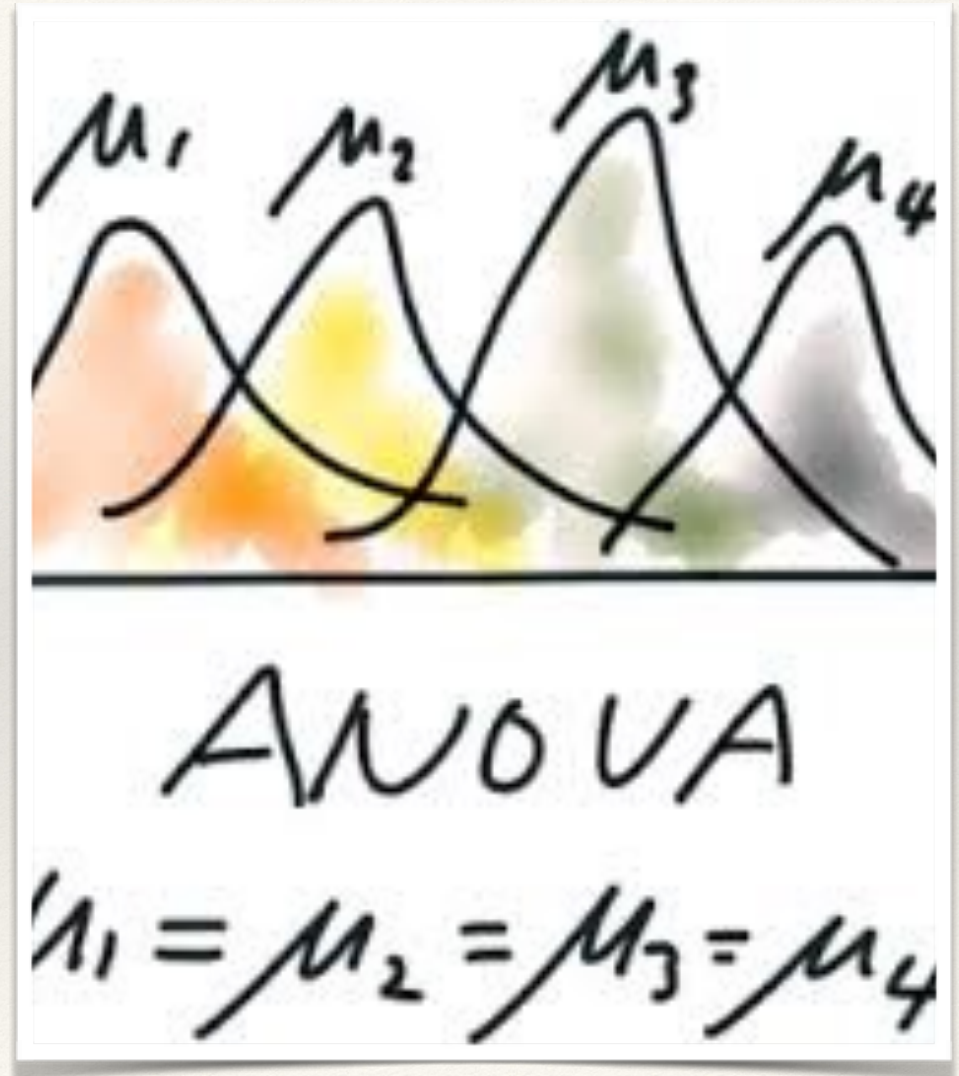
- ❖ In order to properly prepare those who will need an upper division research methods class, there are three central things we can do.
  - ❖ Emphasize concepts
  - ❖ Emphasize the use of technology, and not just calculators by computer software as well.
  - ❖ Spend as much time as possible on ANOVA, which I'll discuss in more detail next.



# Topics that we should emphasize more

- ❖ ANOVA

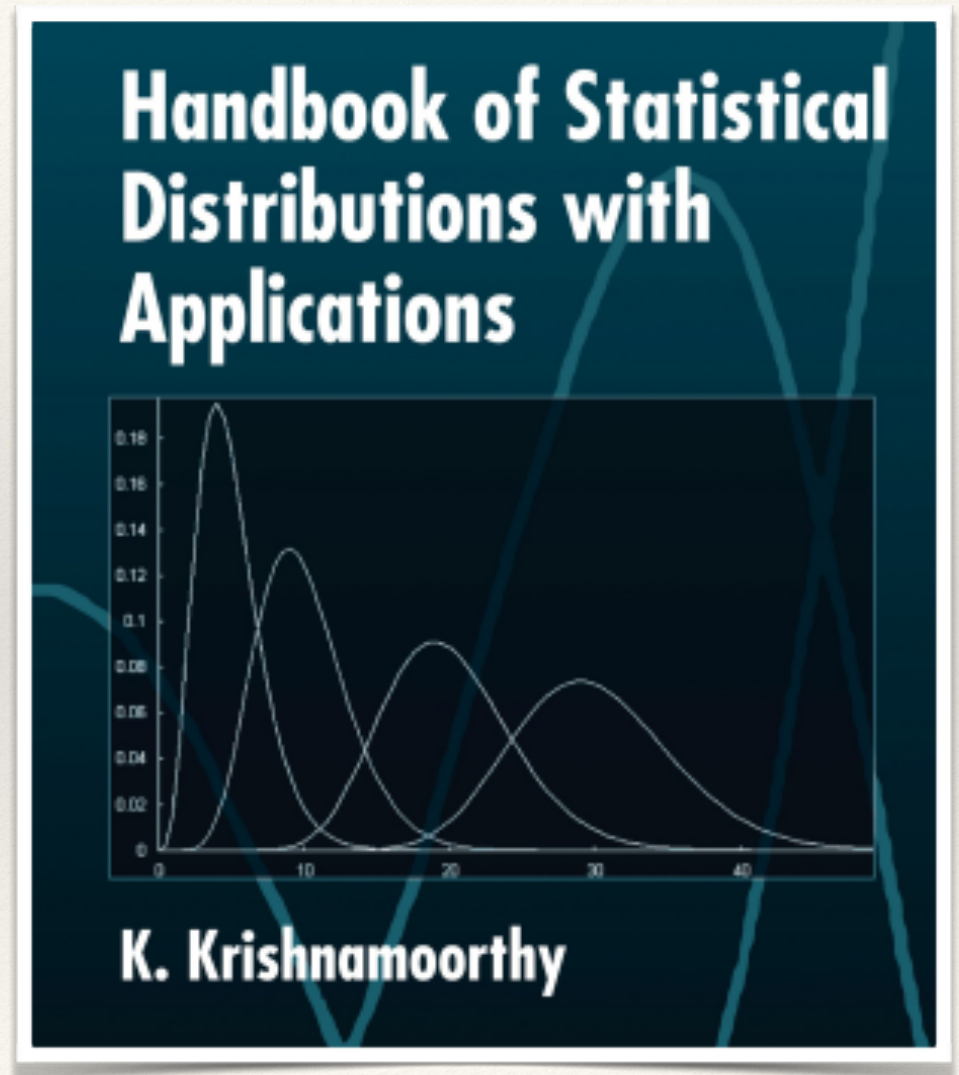
- ❖ This is the last topic that is covered in Math M15, and naturally then is the most important topic for upper-division research methods courses in the social sciences. The use of technology here allows more time to talk about ANOVA in a meaningful way.





# Topics that we should emphasize more

- ❖ Distributions
  - ❖ We are required to cover four ( $z$ ,  $t$ ,  $chi$ -squared, &  $F$ ), but as much as possible describe why these distributions are what they are and why we use a particular one for a given situation.





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A topic we should emphasize less, or at least make more clear its inherent limitations since no talk that I give on statistics is complete unless I criticize hypothesis testing

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- ❖ Hypothesis Tests, are undeniably important; however, they have some serious issues that confidence intervals avoid.

discussed.

The remainder of the text presents significance tests for a variety of situations. It is important to become familiar with these tests, if for no other reason than their frequent use in social science research. However, we'll also introduce confidence intervals that describe how far reality is from the  $H_0$ -value.



# Levels of significance

- ❖ For students to understand that  $\alpha = 0.05$  is not the only level of significance in the world.
- ❖ My wife and I have been arguing about this for years since she is in the medical field (Pharmacist) and I'm a mathematical psychologist.

Friday, March 13 – SGMH 1307		Saturday
8:30	☕ Arrive early, fuel up, and install your talk 🗣️ Michael Birnbaum – CSU Fullerton <i>Whether you are well-endowed depends on the Point-of-View</i>	8:30 ☕
9:05	Krzysztof Kontek - Warsaw School of Economics <i>Now is the Winter of our Discontinuity</i>	9:05
9:45		9:45
10:25	<b>Morning coffee break</b>	10:25
10:50	Michal Lewandowski – Warsaw School of Economics <i>Range-dependent utility for decisions under risk and ambiguity</i>	10:50
11:30	Richard John – University of Southern California <i>Presumption of Guilt Beyond an Unreasonable Doubt</i>	11:30
12:10	<b>Lunch (on your own)</b>	12:10
2:00	Brendan Purdy – Moorpark College <i>If Evolutionists don't teach creationism, why do Bayesians teach NHST?</i>	2:00
2:25	Hang (Henry) Shen – UC Riverside <i>I'm all 'bout that Bayes, 'bout that Bayes</i>	
2:50	☕ <b>Afternoon snack break</b> 🗣️	2:50
3:05	David Weiss – Independent Consultant <i>Look what they've done to my data ma</i>	3:05
3:30	Gilly Koritzky – Brain and Creativity Institute, USC <i>The biggest loser thinks long-term</i>	3:30
3:55	<b>Final stretch break</b>	3:55
4:10	Manel Baucells – USC <i>Correlation Between Anomalies and Theories of Mental Accounting</i>	4:10



# Something else we can do, or why Stats is so fun to teach

- ❖ Timely and relevant examples
  - ❖ One of the great things about teaching statistics is that there are examples in the news everyday that one can use for the illustrations of concepts in class. I get the *IBD* and bring it to class everyday, and more often than not am able to take at least one example from it.

## Government Hires; Private Sector Tires

Government is on a hiring spree even as private job growth has slackened

### Private-sector jobs



### Government jobs



Source: BLS

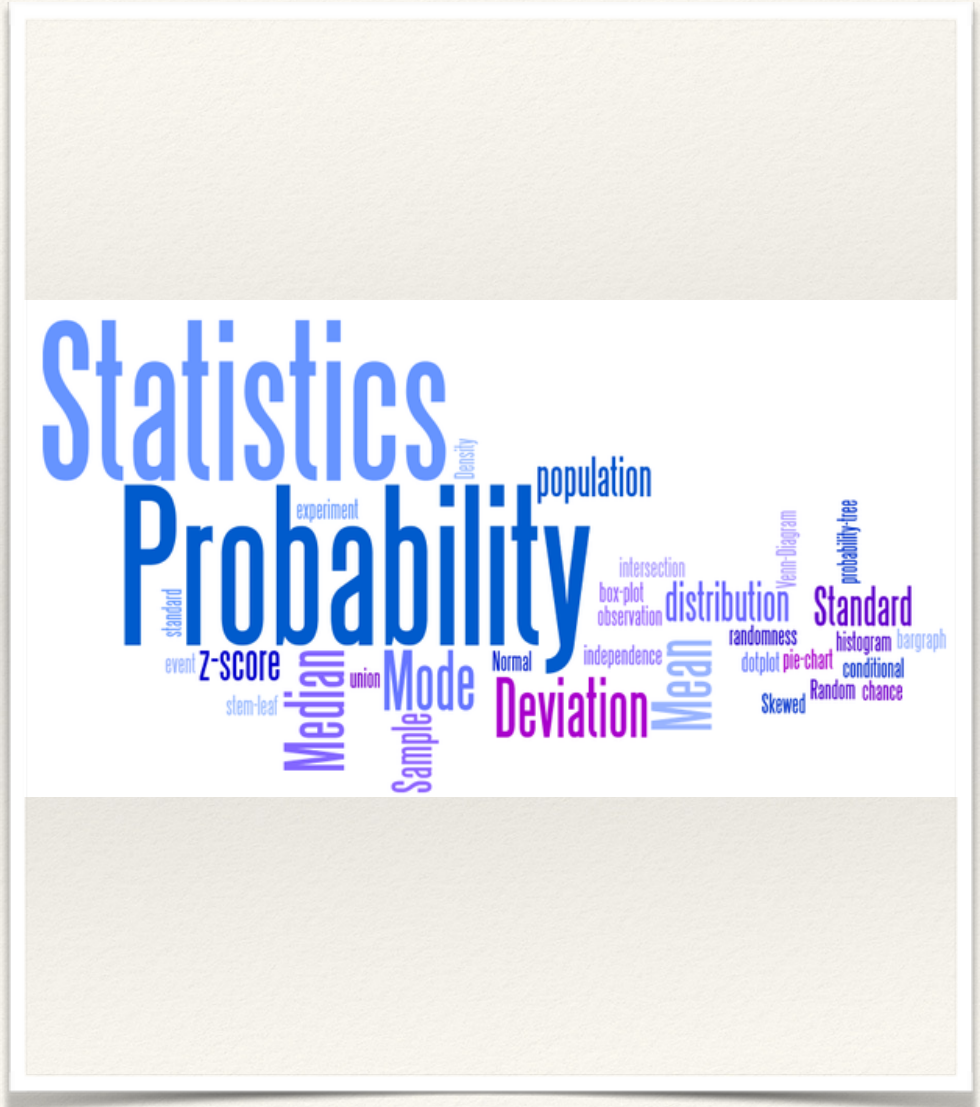


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## Two Ways the Sabbatical Research is serving me... and hence the district, college, department, and students!

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- ❖ Certainly has improved my statistics teaching, and I continue to plan to teach at least three Math M15 courses each semester, with two in the summer.
- ❖ Working on the curriculum Moorpark College version of Statway.
- ❖ Mentoring new part-time and full-time faculty who teach stats.





*Finis*

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Questions?

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Thank you for your time.

