

Does learning mode affect student grades in an elementary statistics course?

Lilly Austin Conference Jan 10, 2020

Dr. John Griffith

Dr. Bobby McMasters

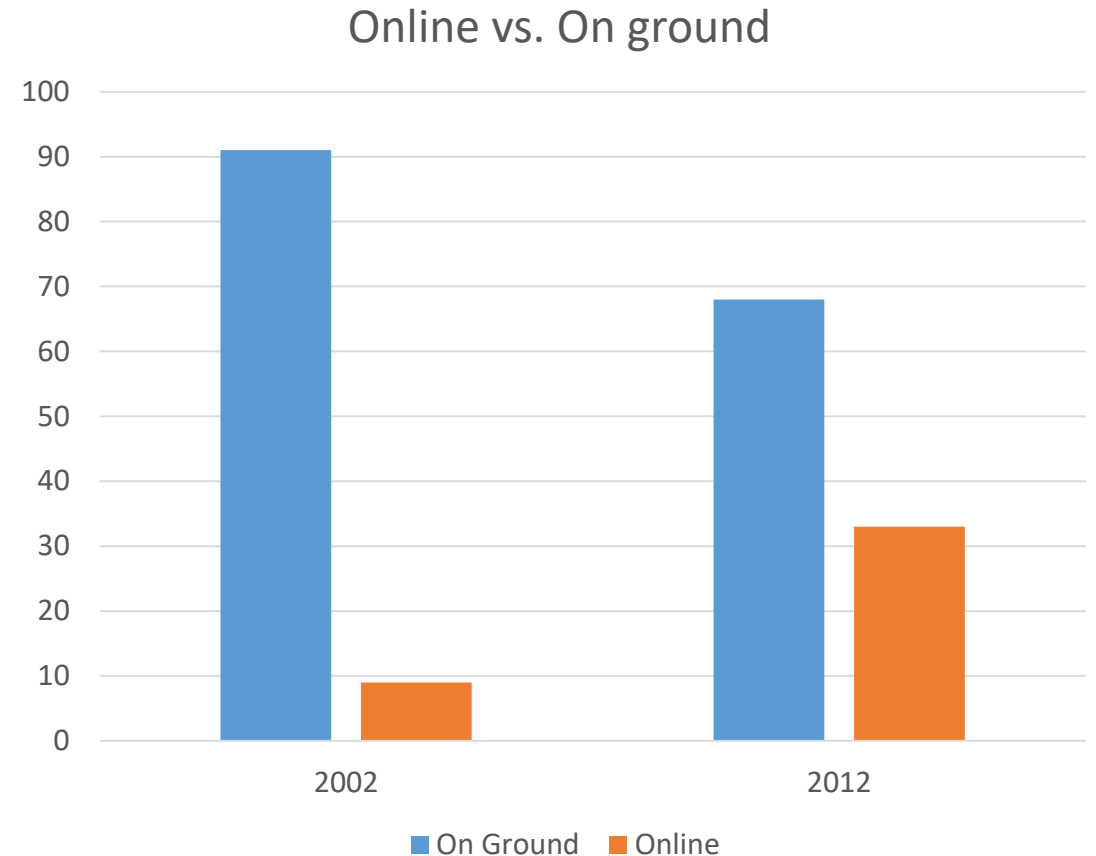
Dr. Emily Faulconer

Dramatic shift from on-ground to online registrations.

More students working full time

- 20 million students
- 25% full time college/work
- 40% Work <30 hrs a week

(Bureau of labor Statistics 2019; Deruy, 2015)



How do you make a class great?

Online



Classroom



What the literature says

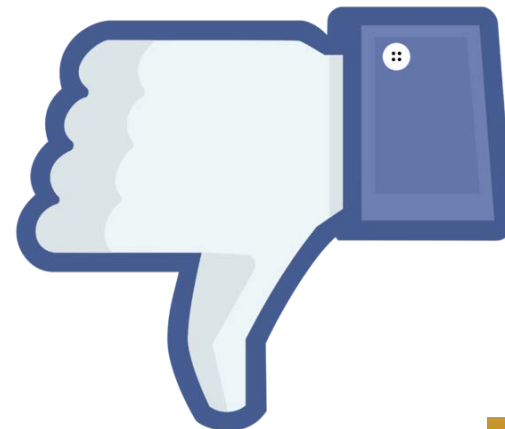
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- Meta Analysis
 - Johan et al, 2007
 - Lundenberg et al., 2008



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- Meta Analysis
 - Sizemant et al, 2006; Williams et al, 2006; Means et al 2009



Online courses

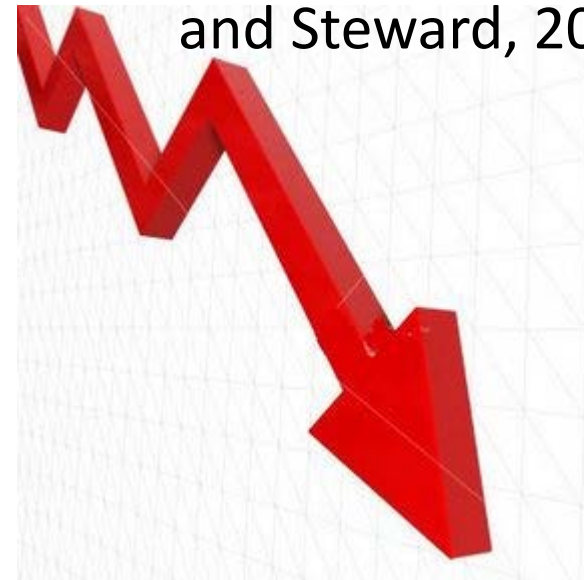
Students more likely to:



(Johnson and Meija, 2014)

Persistence

Jaggars et al., 2013, Murphy and Steward, 2013).



Best practices

Discussions

- 1/3 ratio to initial posts
- Initial post first
- Ask questions
- High activity

Grading

- Within 7 days of due date
- Give feedback
 - What was good
 - What needs improvement
- Check points

Details about STAT 211

“Real” Simulation Problems

Airshow Day 1: Mean and Standard Deviation
Module
2

Discussion

Introduction
⌚

This discussion provides a simulated exercise using two of the most popular descriptive statistics, mean and standard deviation. You are strongly encouraged to complete the textbook reading and start the MyStatLab Homework assignment before beginning this discussion. You need to be familiar with mean and standard deviation, their interpretation and why they are typically calculated and reported together.

In this discussion, you are required to calculate and interpret reported mean and standard deviation values. In the [Module 2 - Assignment: Airshow Day 1: Winner](#), you will be required to concisely report results obtained in this discussion.

Scenario
✈️

Congratulations on your promotion! You are now leading the team. After one week in your new position, your supervisor provides guidance for your new assignment, responsibility for an important and “very visible” task.

In one month, your airport is hosting an airshow that allows potential future customers to observe the flying capabilities of civilian and military aircraft. Support teams are planning for over 100,000 to attend the two-day event. Your tasks are to determine and officially report the “Winner,” a very prestigious honor; highly valued in both civilian and military communities.

Fortunately, your predecessor (an Embry-Riddle graduate) has provided a Microsoft Excel template:

AIRSHOW -- US MILITARY AIRCRAFT PERFORMANCE										
	Tankers		Transport	Bomber	Fighters			Sortie	Sortie	
Flight Name	KC-135	KC-10	C-17	B-52	F-15	F-16	F-22	F-35	Mean	Standard Deviation
Sortie 1										
Sortie 2										
Sortie 3										

Real “Reporting” Assignments

Airshow Day 2: Airshow Champion
3


Assignment

Scenario
✈️

During Day 2 of the airshow, you are required to select and report an Airshow Champion. Use the spreadsheet that you created for the [Module 3 - Discussion: Airshow Day 2: Probability](#) discussion to:

- Determine the aircraft winner.
- Report the probability of another aircraft scoring **higher** than the winner.

Report values of probability to four decimal places, i.e., $p = 0.1234$.



Report the Champion
📄

Now that you have the simulated data, report the Airshow Champion. Report the champion in a Memorandum of Understanding (MOU). Your MOU should be a maximum of one page with one-inch margins using 11 point font and consist of only the following three paragraphs:

- Introduction - Prepare the audience for what he/she is about to read.
- Results - The facts.
- Conclusion(s) - Results based, concise and to the point; actionable.

Review the [Writing Suggestions](#) page for tips. Use this format for your document:

MEMORANDUM OF UNDERSTANDING

TO: 97th AMW - USAF

FROM: Your Name

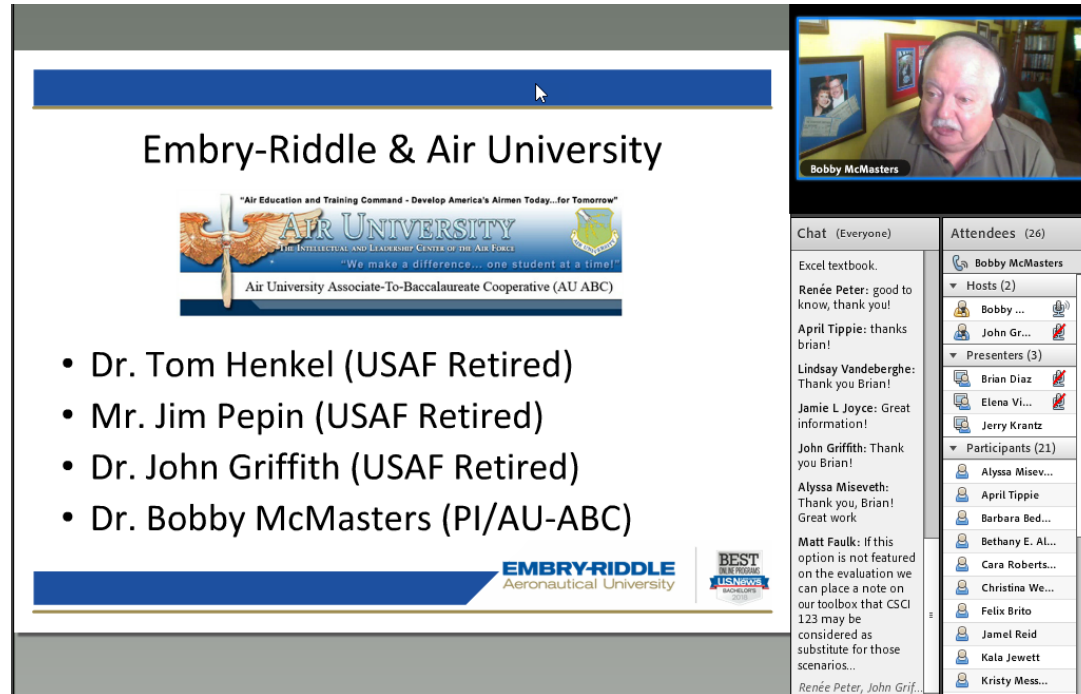
DATE: Add Assignment Due Date

SUBJECT: Determined by Student

Learning Modalities

EagleVision Example

Modalities



The screenshot displays a meeting interface. On the left, a presentation slide for Embry-Riddle & Air University is shown. The slide features the university's logo and a list of speakers: Dr. Tom Henkel (USAF Retired), Mr. Jim Pepin (USAF Retired), Dr. John Griffith (USAF Retired), and Dr. Bobby McMasters (PI/AU-ABC). On the right, a video feed shows a participant named Bobby McMasters. Below the video feed is a chat window with messages from participants like Renée Peter and April Tippie. To the right of the chat is a list of attendees, including Bobby McMasters, John Griffith, and others.

Embry-Riddle & Air University

"Air Education and Training Command - Develop America's Airmen Today...for Tomorrow"

EMBRY-RIDDLE
AERONAUTICAL UNIVERSITY

The Intellectual and Leadership Center of the Air Force

"We make a difference... one student at a time!"

Air University Associate-To-Baccalaureate Cooperative (AU ABC)

- Dr. Tom Henkel (USAF Retired)
- Mr. Jim Pepin (USAF Retired)
- Dr. John Griffith (USAF Retired)
- Dr. Bobby McMasters (PI/AU-ABC)

EMBRY-RIDDLE
Aeronautical University

BEST
IN PROGRAM
USNews

Chat (Everyone)

Attendees (26)

Excel textbook.

Renée Peter: good to know, thank you!

April Tippie: thanks brian!

Lindsay Vandenberghe: Thank you Brian!

Jamie L Joyce: Great information!

John Griffith: Thank you Brian!

Alyssa Miseveth: Thank you, Brian! Great work

Matt Faulk: If this option is not featured on the evaluation we can place a note on our toolbox that CSCI 123 may be considered as substitute for those scenarios.

Renée Peter, John Grif...

Bobby McMasters

Hosts (2)

- Bobby ...
- John Gr...

Presenters (3)

- Brian Diaz
- Elena Vi...
- Jerry Krantz

Participants (21)

- Alyssa Misev...
- April Tippie
- Barbara Bed...
- Bethany E. Al...
- Cara Roberts...
- Christina We...
- Felix Brito
- Jamel Reid
- Kala Jewett
- Kristy Mess...

- Online
- Traditional Classroom
- EagleVision Home
- EagleVision Classroom
- Above "Blended" with Canvas Assignments

Non-traditional university

Students

- Non-traditional
- Working adults
- 50% military
- 80% affiliated with military
- Avg. age: 34

Campus

- 90% online
- Also offer on ground and synchronous video
- 9 week terms
- 5 major terms a year
- >23K Pt

It is hard to compare online vs on ground instruction.

- Terms
- Assignments

STAT 211 Statistics with Aviation Applications Online Course Syllabus

Credit Hours: 3

Delivery Method: Online (Internet/Canvas)

Required Course Materials

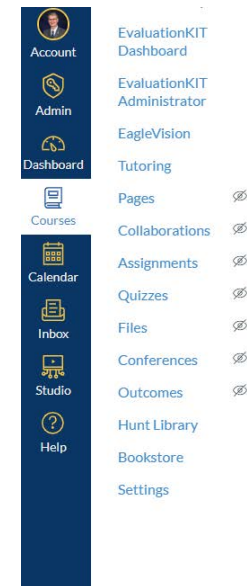
Triola, M. (2018). *Elementary statistics using excel and MyStatLab access card* (6th ed.). Boston, MA: Pearson.

ISBN 978-0134763781. This ISBN includes a hardcover copy of the textbook **and** the MyStatLab access card. MyStatLab and the e-textbook are available for purchase (excluding physical textbook) in your Canvas course; click on "MyLab and Mastering" to explore.

Note: MyStatLab student access is a course requirement

Caution: If the MyStatLab fourteen (14) day trial period is selected, do not let the trial time expire before purchasing access.

Triola, M. (2018). *Elementary statistics using excel and MyStatLab access card* (6th ed.). Boston, MA: Pearson.



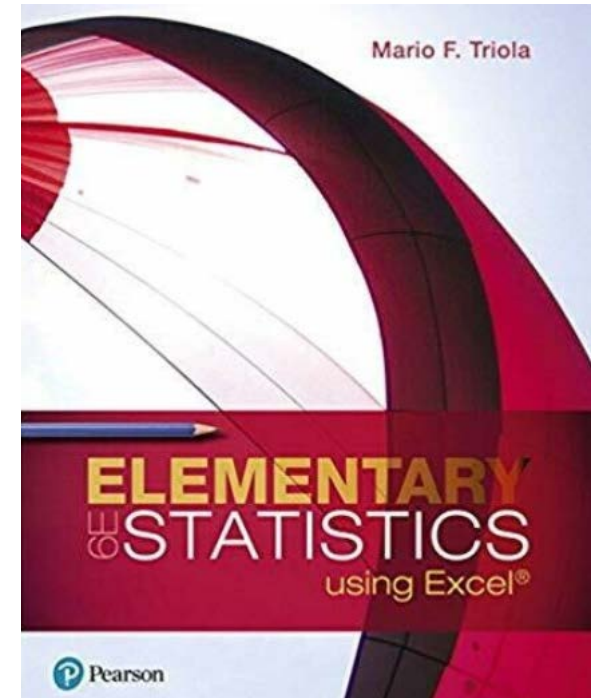
A vertical navigation sidebar for a Canvas LMS course. It features a dark blue background with white icons and text. The top section includes 'Account', 'Admin', and 'Dashboard'. The middle section includes 'Courses', 'Calendar', 'Inbox', 'Studio', and 'Help'. The bottom section includes 'EvaluationKIT Dashboard', 'EvaluationKIT Administrator', 'EagleVision', 'Tutoring', 'Pages', 'Collaborations', 'Assignments', 'Quizzes', 'Files', 'Conferences', 'Outcomes', 'Hunt Library', 'Bookstore', and 'Settings'. Each item has a small icon to its left.



A screenshot of a Canvas LMS course page for 'STAT 211 Statistics with Aviation Applications'. The page title is 'STAT 211 Statistics With Aviation Appl - Jan 2019 - O...'. Below the title is a blue header with the course name and a 'Start Here' button. The main content area features a large image of a hand holding a pen over a tablet displaying a bar chart and a hand holding a pen over a document with a table. Below the image are buttons for 'Start Here', 'Instructor Bio', and 'Academic Resources'. A note at the bottom states: 'Be sure to check the Announcements section each time you access the course. Term Dates: 01/07/19 to 03/10/19 Your Instructor: John Griffith'.

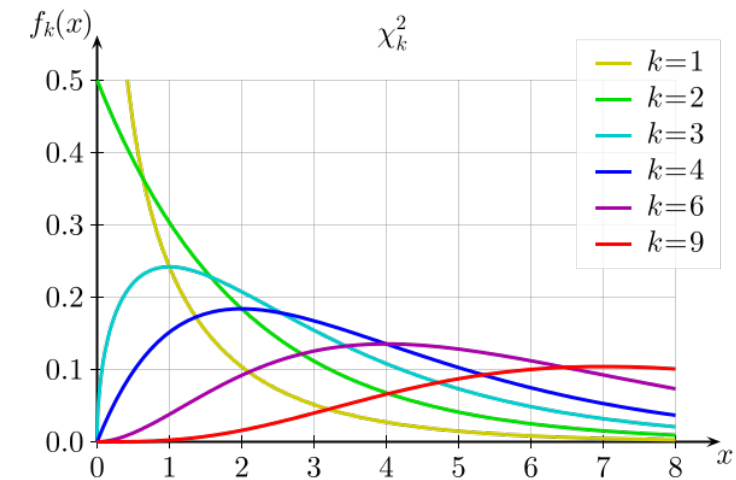
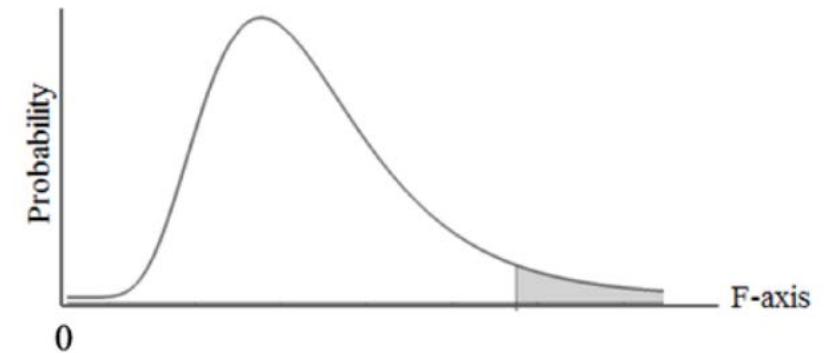
Statistics course

- 1st stats course taken
- >2,000 enrollments per year
- Augmented by Pearson
- Use Triola Textbook
- All instructors
 - Same book
 - Same syllabus
 - Same graded items



Method

- Statistics
 - ANOVA for final course grades
 - Chi Sq for all other
- Dependent variables
 - Grades
 - Grade distribution
 - Pass rates
- Independent
 - Mode of learning



Hypotheses

- **Ha₁**. Student **end of course scores** in classroom, on-line and video synchronous learning modes are not all statistically equivalent
-
- **Ha₂**. End of **course grade distributions** in classroom, on-line, and video synchronous learning modes of delivery are not statistically independent.
-
- **Ha₃** Student **pass rates** in classroom, on-line and video synchronous learning modes are not statistically independent.

Treatment of the data

- End of course grades
 - One way ANOVA
- Course grade distribution
 - Chi Square test of independence
- Pass comparison
 - Chi Square test of independence
- All tests $\alpha=.05$

End of course grades

Source	DF	SS	MS	F-Statistic	P-value
Mode	3	1650.05	550.02	1.41	.239
Error	303	117954.89	389.29		
Total	307	119604.94			

Levene's Test for Homogeneity of Variance

Test Statistic	DF 1	DF 2	P-value
2.32	3	303	.075

Course grade distribution

	Classroom	Videosynchronous Classroom	Videosynchronous Home	Online	Total
A	14	7	19	126	166
B	4	4	11	63	82
C	3	0	7	19	29
D	1	1	1	6	9
F	0	0	5	16	21
Total	22	12	43	230	307

Chi Square Test:

Statistic	DF	Value	P-value
Chi Square	12	11.37	.497

Pass rates

	Classroom	Videosynchronous Classroom	Videosynchronous Home	Online	Total
Pass	22	12	38	214	286
Fail	0	0	5	16	21
Total	22	12	43	230	307

Chi Square Test:

Statistic	DF	Value	P-value
Chi Square	3	4.05	.26

Results

- Statistics (n=307) No significant difference
 - Final course grades (p=.239) \(\😊\)
 - Grade Distribution (p=.497) \(\😊\)
 - Pass (p=.26) \(\😊\)

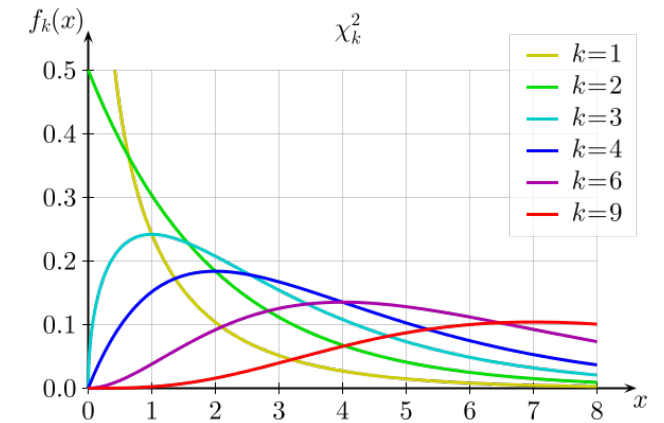


One trick pony?

- Similar results in
 - Chemistry
 - Physics



Method




- Chemistry and Physics
 - Chi Square or Fishers exact test $\alpha = .05$
 - Bonferroni test used in post hoc $\alpha = .00833$
- Dependent variables
 - Grades
 - Grade distribution
 - Withdraw rates
- Independent
 - Mode of learning





Results

- Chemistry (n=823)
 - Grade Distribution - Online earning more As
 - Withdraw rate 
 - Pass 

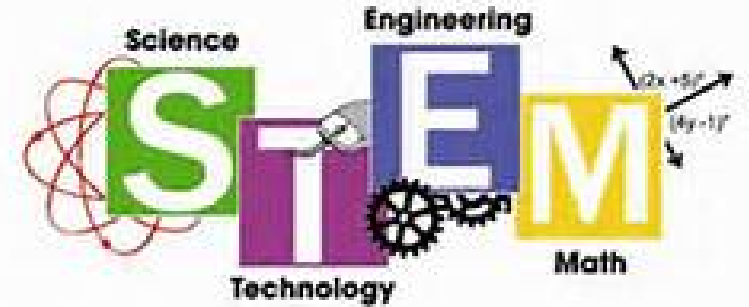
- Physics (n= 1964) – no significance in
 - Grade Distribution 
 - Withdraw rate 
 - Pass (online higher than EV classroom) 



Takeaways

- Overall no significant differences in courses analyzed
- Students selected courses based on convenience and monetary reasons
- 80% military affiliated
- Canvas LMS
- At least 25% faculty terminally degreed
- Instructor presence key to effective online courses

Questions?



John Griffith, Ph.D.
griff2ec@erau.edu

Dr. Bobby McMasters
mcmas245@erau.edu

Dr. Emily Faulconer
faulcone@erau.edu



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