6/08/20

Agenda for Math 5710 ♬ Meeting #28 ☻☺ 7/31/20 (8:00 a.m. – 9:10 a.m.)

1. Hello:

Brigham City:	Adam Blakeslee	Ryan Johnson	Tyson Mortensen	
Logan:	David Allen	Natalie Anderson	Kameron Baird	Stephen Brezinski
	Zachary Ellis	Adam Flanders	Brock Francom	Xiang Gao
	Ryan Goodman	Janette Goodridge	Hadley Hamar	Phillip Leifer
	Brittney Miller	Jonathan Mousley	Erika Mueller	Shelby Simpson
	Steven Summers	Matthew White	Zhang Xiaomeng	

2. Note the syllabus' activity list for today:

28: F/7/31	1. Construct the following concepts and comprehend associated communication structures: inferential statistics, null hypothesis, types I & II errors, sampling distributions, and probability functions that are spinoffs of the Central Limit Theorem. 2. Take advantage of Quiz 28.

3. Briefly raise issues and questions prompted by the following homework assignment:

A. Study our notes from today's meeting.

B. Study the sample responses to Quiz #27's prompts that are posted in the indicated page section of *Canvas*.

C. Comprehend Entries 049A–B & 050 from our *Glossary*.

D. From the Video Page of *Canvas*, view with comprehension the videos named "intro normal distributions kahn ," "central limit theorem intro, and "central limit theorem animation." Please take care of *intro normal distributions kahn* first.

4. Wrap our minds around (even deeper than before) the distinction between descriptive and inferential statistics as well as the distinction between population parameters (e.,g, μ, σ, N, ρ) and sample statistics (e.g., $\bar{x}$, s, n, r).

5. Take a cursory run through a few research studies that analyzed sample data via inferential statistics for the purpose of inferring probability propositions about population parameters from sample statistics.

   A. *Examining Differences between Preteen Groups' Spatial-Scientific Understanding: A Quasi-Experimental Study* (JER)

      i. Quickly pass our eyes over the entire report

      ii. Interpret the statistical findings:

TABLE 7. Percent Scores on PSVT-Rot for Control and Experimental Groups

		Pre %		Post % correct					
	n	M	*SD*	M	*SD*	% gain score	*F*	*p*	Partial η^2
Control all	70	43.7	20.2	49.5	21.6	5.8	10.8	.00*	.14
Experimental all	111	35.6	17.4	40.1	20.3	4.5	7.04	.01*	.06
Control males	35	45.9	22.8	52.9	23.4	7.0	6.26	.02*	.16
Experimental males	61	38.4	17.1	42.9	22.4	4.5	3.04	.09	.05
Control females	35	41.6	17.1	46.1	19.3	4.5	4.47	.04*	.12
Experimental females	50	32.2	17.2	36.7	17.0	4.5	4.53	.04*	.09

Note. PSVT-Rot = Purdue Spatial Visualization Rotation Test.
*$p < .05$.

B. *Investigating Effect of Oragami-Based Instruction on Elementary Students' Spatial Skills and Perceptions* (JER)

i. Quickly pass our eyes over the entire report

ii. Interpret the statistical findings:

TABLE 2. Descriptive Scores for the Subcategories of the Spatial Ability Task

	Pretest		Posttes	
	M	*SD*	M	*SD*
Spatial task (of 8)	6.55	1.25	6.63	1.13
Spatial numerical task (of 8)	5.24	1.84	5.95	1.97
Mental rotation task (of 8)	3.47	2.49	4.79	2.59
Informal area measurement task (of 5)	4.10	1.47	4.08	1.36
Paper-folding task (of 6)	2.84	1.58	3.58	1.90

TABLE 3. Descriptive Statistics for Pretest and Posttest Scores for Each Category of the Spatial Ability Test

	Pretest		Posttest	
	M	*SD*	M	*SD*
Spatial visualization	18.73	3.98	20.23	4.92
Spatial orientation	3.47	2.49	4.79	2.59

C. *The Influence of Documentary Films on 8th Grade Students Views about Nature of Science* (ESTP)

i. Quickly pass our eyes over the entire report

ii. Interpret the statistical findings:

Sampling

This study was conducted in two middle schools, located in Eskişehir, Turkey during the fall semester of the 2012-2013 academic year. A total of 113 8th grade students (57 from the experimental groups [EG] and 56 from the control groups [CG]) from four classes, all of whom were taking the compulsory *science and technology course*, participated in the study. There was no significant difference between the two groups' level of achievement in the *science and technology course* that they had taken the previous year ($t_{(109)} = 1.932$, $p > .05$). Accordingly, two of the classes were randomly selected to be the EG. Both groups were instructed for an equal amount of instructional time.

Table 5
Wilcoxon Signed Ranks Test Results of Control Group's Pre and Post-test Scores about NOS Themes

NOS	Post-Pre Test	*n*	Average Rank	Total Rank	*z*
NOS-1	Negative Rank	8	7.00	56.00	.832
	Positive Rank	5	7.00	35.00	
	Same	42			
NOS-2	Negative Rank	8	7.50	60.00	.535
	Positive Rank	6	7.50	45.00	
	Same	25			
NOS-3	Negative Rank	8	6.00	48.00	1.508
	Positive Rank	3	6.00	18.00	
	Same	23			
NOS-4	Negative Rank	7	8.50	59.50	.500
	Positive Rank	9	8.50	76.50	
	Same	39			
NOS-5	Negative Rank	8	8.00	64.00	.258
	Positive Rank	7	8.00	56.00	
	Same	38			

*$p < .05$.

Table 3
The Mann Whitney U-test Results of the Groups' VNOS-E Questionnaire Pre-test Scores

NOS Themes	Group	*N*	Average Ranking	Total Ranking	*U*	*p**
NOS-1	Experimental	55	53.75	2956.50	1416.500	.440
	Control	55	57.25	3148.50		
NOS-2	Experimental	40	36.39	1455.50	635.500	.024*
	Control	42	46.37	1947.50		
NOS-3	Experimental	38	37.11	1410.00	669.000	.210
	Control	41	42.68	1750.00		
NOS-4	Experimental	55	57.53	3164.00	1401.000	.388
	Control	55	53.47	2941.00		
NOS-5	Experimental	54	54.98	2969.00	1378.000	.704
	Control	53	53.00	2809.00		

*$p < .05$.

D. A study Jim conducted as an expert witness for the defense.

i. Quickly run through a quick overview of the case and the study

ii. Examine the primary evidence presented by the procecution

Crystal County Board of Education

June 18, 1996

To: Olden Dickerson, Assistant Superintendent
From: Dr. Rush Thomas, Ed.D.
Director of Special Education and School Psychology
Re.: Statistical Comparison of Scores: First vs. Second Administration of State Core Examinations

As per your request for a comparison of scores for first and second administration of State Core tests for Mr. Lorenzo's second grade class in Reading, Math, and Science. Because of the audience for this study, an elaborate statistical design was not attempted but rather a simple direct comparison of first and second administration test scores in the three subject areas was done using the t-test for related samples (Roscoe, 1969). The results of these three comparisons follow:

Subject	Reading	Math	Science
1st Admin. Mean	87.20	88.76	78.72
2nd Admin. Mean	75.48	75.67	72.04
Mean Difference	11.72	13.09	06.68
No. of Comparisons	21	21	25
t-statistic	6.828	5.045	5.186
degrees of freedom	20	20	24
significance level	$p<.001$	$p<.001$	$p<.001$

In each of the above cases, the probability of differences of this magnitude occurring by chance is less than 1 in 1,000 times. From a statistical standpoint, test scores from the first administration were significantly higher than test scores obtained in the second administration in Reading, Mathematics, and Science.

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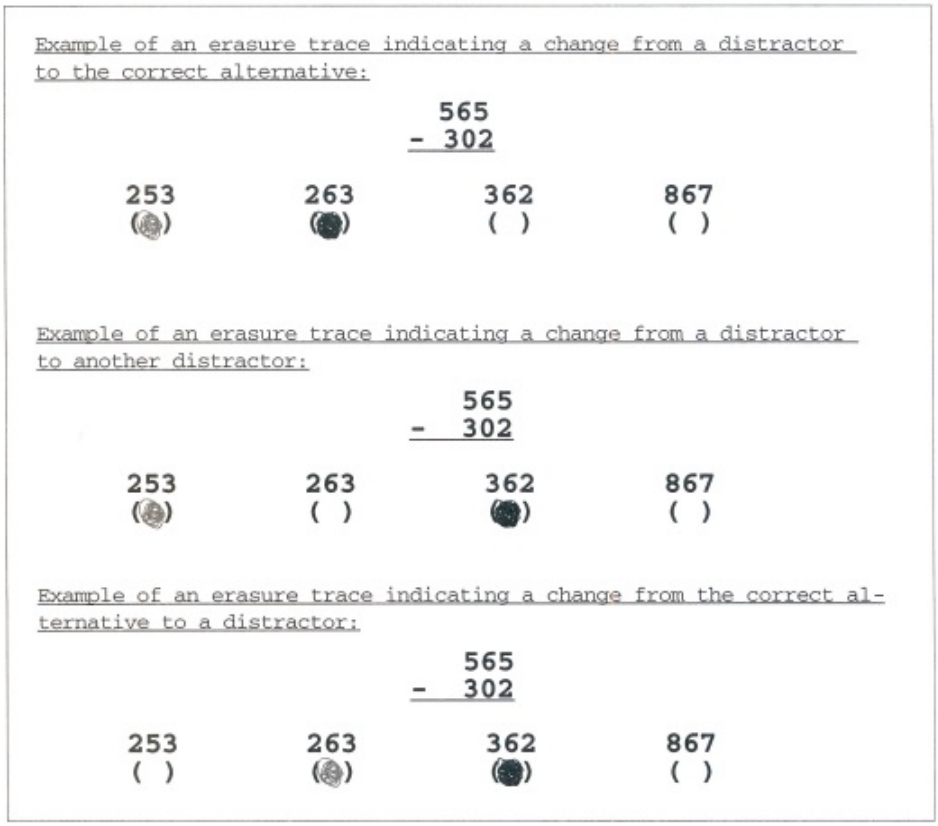
iii. Comprehend a part of Jim's study that tested a null hypothesis.



5. Comprehend the meanings of the following players in research studies that employ inferential statistics:

A. Random sample

B. Data strings

C. Theoretical Sample distribution

D. Random sampling error

E. Null hypothesis (i.e., H_o)

i. Inferential statistical test (e.g., z-test, t-test, F-test, χ^2-test)

ii. Reject H_o $\veebar$ fails to reject H_o

iii. p values

F. Statistical significance

G. Type I error

H. Type II error

I. Some common misinterpretations of inferential statistical results

6. Take advantage of Quiz 28.

7. Complete the following assignments prior to Meeting #29:

A. Study our notes from Meeting #28.

B. Study the sample response to Quiz #28's prompt.

C*. Comprehend the following case:

A biologist conducted a study to assess the effects of a particular medication on managing the symptom of a particular viral infection in lab rats. She administered the medication to an experimental group of infected rats and a placebo to a control group of infected rats. She then tested the both groups that produced interval scores reflecting the degree of symptoms of the disease the rats exhibited. Let E = the string of scores from the experimental group and C = the string of scores from the control group. She then employed an F-test of the following null hypothesis:

$$H_o : \mu_E = \mu_C$$

Because the F value was such that $p > 0.05$, the researcher did not reject H_o.

Examine each of the following propositions to determine its true value; indicate your choice by circling either "T" or "F" and then write a paragraph defending you choice; post the resulting document using designated *Canvas* assignment link:

i. The results of the F-test indicated that the difference in the two means is not statistically significant.

T F

ii. The results of the F-test indicated that it is unlikely that the null hypothesis is true.

T F

iii. The results of the *F*-test suggests that there was hardly any difference in the effects of the experimental medication and the placebo on the scores.

T F

iv. The results of the *F*-test indicated that $\left|\overline{E}-\overline{C}\right|$ is too near 0 to justify rejecting H_o

T F

D*. Comprehend the following case:

A biologist conducted a study to assess the effects of a particular medication on managing the symptom of a particular viral infection in lab rats. She administered the medication to an experimental group of infected rats and a placebo to a control group of infected rats. She then tested the both groups that produced interval scores reflecting the degree of symptoms of the disease the rats exhibited. Let E = the string of scores from the experimental group and C = the string of scores from the control group. She then employed an *F*-test of the following null hypothesis:

$H_o : \mu_E = \mu_C$

Because the *F* value was such that $p < 0.05$, the researcher rejected H_o.

Examine each of the following propositions to determine its true value; indicate your choice by circling either "T" or "F" and then write a paragraph defending you choice; post the resulting document using designated *Canvas* assignment link:

i. The results of the *F*-test indicated that the difference in the two means is statistically significant.

T F

ii. The results of the *F*-test indicated that it is unlikely that the null hypothesis is true.

T F

iii. The results of the *F*-test suggests that there was a difference in the effects of the experimental medication and the placebo on the scores.

T F

iv. The results of the *F*-test indicated that the deviation of $\left|\overline{E}-\overline{C}\right|$ from 0 is unlikely to be solely a function of sampling error.

T F

E. Study the sample responses to the homework prompts posted on the indicated page of *Canvas*.

8. Note this quote from Andre Gidé (1869-1951):

Believe those who are seeking the truth. Doubt those who find it.