Supplementary Online Information

Structured Writing Assignment Prompt

Provide a *simple* explanation of hypothesis testing. Your explanation needs to be so simple that a fifth grader can understand it. Make sure your explanation does not include any statistical jargon. Your explanation must be age-appropriate and not use any words that would be beyond the abilities of a fifth grader.

Use the following template that (you will fill in the blank sections) researchers have found successful in explaining complex concepts to children.

Your submission should consist of four items (follow the prompts):

- Definition: What is a hypothesis test? Explain in one short sentence.
- Long example/Personal experience: How would a fifth grader relate to a hypothesis test? What experiences in their life can be related to this concept?
- Compare/Contrast: Is there anything that a hypothesis test can easily be confused with? What is it NOT? Remember that your fifth grader still needs to be able to relate to these examples.
- Short example(s)/Application: Are there any other areas that could make hypothesis tests a useful concept for fifth graders? You can also push their limits and provide examples of how people in different professions use this concept.

How your writing will be evaluated (your submission should consist of 250-500 words total):

- 30 points: each section of the template is filled, explanation and information are sufficient for a fifth grader, there is no jargon.
- 20 points: each section of the template is filled, but information is insufficient, there is no jargon
- 10 point: all sections of the template are filled, but information is insufficient, there is some jargon
- 0 points: some sections of the template are unfilled, there is much jargon

Alternative Writing Assignment Prompt (Fall 2017)

Pick a news item and describe how the use of hypothesis testing could have improved the coverage of the news item. Include the hypothesis statements in your essay, describe the hypothesis statements, and justify your decision. Include the complete reference for your news items in your submission.

How your writing will be evaluated (your submission should consist of 250-500 words total):

- 30 points: Well explained how news item can be improved using hypothesis testing
- 20 points: Good explanation of how news item relates to the hypothesis testing but some use of statistical terminology is incomplete
- 10 point: explanation is incomplete and some statistical terminology is used incorrectly
- 0 points: poor explanation, wrong use of statistical terminology

Sample Structure Writing Assignment (Standard Deviation)

Definition: The standard deviation tells us something about how spread out a group of numbers are relative to the middle of the numbers.

Long example/personal experience: It is one week after Halloween trick-or-treating and you want your favorite ice-cream. Your parent is worried, however, that you have eaten too much candy this week. They count the remaining candy in your pumpkin bucket and say: "You have eaten 28 pieces of candy this week – that is only 4 pieces of candy per day! Very good, let us go and get you some ice-cream."

But did you actually eat only 4 pieces of candy each day this past week? Oh, no ☺. Now is a good time to talk about standard deviation.

The standard deviation of the number of pieces of candy eaten per day tells us something about how consistent we were in our daily candy eating.

A large standard deviation would mean that you had 22 pieces of candy the day after Halloween, then you got worried that your parent would notice and get upset (and may be your stomach was hurting) and so you then had only 1 piece of candy each day for the rest of the week. You see how the numbers 1, 1, 1, 1, 1, 1, are far from the number 22? That large spread in the numbers makes for a large standard deviation.

A small standard deviation would mean that you decided to have about the same number of pieces of candy every day, for example having 7 the day after Halloween, then 2 the day after that, then 3, then 5, then 4, then 6, then 1. You see how numbers 1,2,3,4,5,6,7 are close together? That small spread in the numbers makes for a small standard deviation.

Compare/Contrast: So, is standard deviation simply the distance between the smallest and the largest number? Oh, no. What grown-ups measure with the standard deviation is the difference between how many pieces of candy you ate each day and the number of pieces of candy you ate on average each day. And the standard deviation would be very small, 0, if you really ate 4 pieces of candy every day.

Short Example/Application: One application of the standard deviation would be in planning for a birthday party. Let us pretend that we always have 20 people (cousins, friends, and relatives) at our birthday party, but not all might eat a piece of cake. Should we have a cake that serves 20 people or will a smaller cake work? If the standard deviation of pieces of cake eaten is large, then it would be hard to determine how many will eat cake at the next party, so we better have a cake that serves 20 people. If the standard deviation of pieces of cake eaten is small, then we can prepare a cake that will serve close to the average number of pieces of cake eaten, say 12, and be reasonably certain that we will have enough cake.

Appendix Estimation Results

Table 4: Treatment Effect Estimation			
	Fall 2017		
	Exam 3	Final Exam	Final Exam Hypothesis Testing Q
ATET (S) vs (0)	0.0369*	0.0451*	0.0665
St. Err.	0.0222	0.0319	0.0423
ATET (A) vs (0)	0.0450*	0.0597*	0.0941**
St. Err.	0.0267	0.0272	0.0434
ATE (S) vs (0)	0.0194	0.0116	0.0378
St. Err.	0.0142	0.0189	0.0268
ATE (A) vs (0)	0.0118	0.1052***	0.1585***
St. Err.	0.0231	0.0292	0.0269
Treated (S)	0.6938	0.7047	0.7223
St. Err.	0.0068	0.0080	0.0112
Treated (A)	0.6862	0.7983	0.8429
St. Err.	0.0202	0.0237	0.0096
Control (0)	0.6744	0.6931	0.6844
St. Err.	0.0139	0.0179	0.0253
N	514	369	369
ATET = average treatment effect on the treated, ATE = average treatment effect, * p<0.10, ** p<0.05, *** p<0.01, robust standard errors reported; S = structured writing assignment, A = alternative writing assignment, results generated with stata teffects ipwra			

Table 5: Regression Analysis						
	Exam 3		Final Exam		Final Exam Hypothesis Q	
Structured writing=S Alternative writing=A	S	A	S	A	S	A
writing score	0.0020**	0.0047	0.0026*	0.0009	0.0027	0.0043
	(0.0010)	(0.0028)	(0.0013)	(0.0041)	(0.0017)	(0.0031)
Homework score	-0.0388	-0.2564	0.0916	0.7012*	0.1090	0.8506**
	(0.0620)	(0.1659)	(0.0855)	(0.3212)	(0.1148)	(0.3120)
Business/Econ Major	-0.0501*	0.2163***	-0.0598*	0.4208***	-0.0571	0.2280***
	(0.0273)	(0.0295)	(0.0357)	(0.0551)	(0.0547)	(0.0492)
Academic Level	0.0303***	0.0110	0.0183	0.0894	0.0353*	0.3542***
	(0.0112)	(0.0781)	(0.0133)	(0.1046)	(0.0204)	(0.0548)
Score Exam 2	0.1616***	0.0123	0.1137*	-0.0253	0.0585	-0.0660
	(0.0515)	(0.1371)	(0.0630)	(0.1906)	(0.0869)	(0.1529)
Enrolled credit hours	-0.0046	-0.0243	0.0009	-0.0749**	-0.0029	-0.1083***
	(0.0037)	(0.0151)	(0.0044)	(0.0313)	(0.0069)	(0.0251)
Residence	-0.0195*	0.0338	0.0182	-0.0805	-0.0105	0.0265
	(0.0117)	(0.0460)	(0.0143)	(0.0672)	(0.0215)	(0.0444)
Previous Math/Stats classes (#)	-0.0085	0.0124	0.0005	-0.0494	-0.0095	0.0621*
	(0.0064)	(0.0222)	(0.0087)	(0.0499)	(0.0130)	(0.0289)
Cumulative GPA prior semester	0.1681***	0.3149***	0.1513***	-0.0624	0.1721***	-0.0009
	(0.0189)	(0.0676)	(0.0226)	(0.0999)	(0.0341)	(0.1231)
Constant	0.0935	-0.1755	-0.0511	1.1970	0.0047	0.6721
	(0.0996)	(0.3153)	(0.1166)	(0.6828)	(0.1836)	(0.6538)
R2	0.356	0.725	0.258	0.847	0.156	0.903
N	405	29	299	18	299	18
F	27.347	.	13.756	.	6.651	.
* p<0.10, ** p<0.05, *** p<0.01, heteroscedasticity corrected standard errors in parenthesis						