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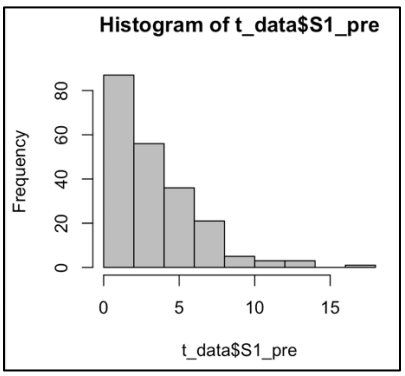
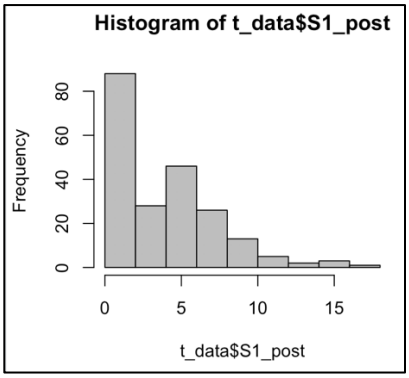
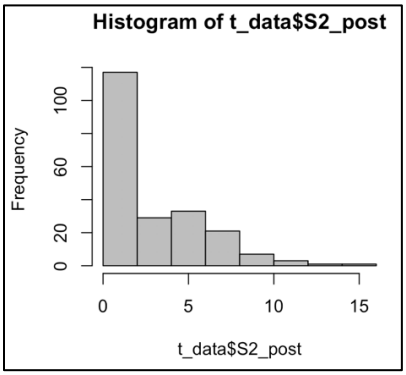
1. Average number of attempts on the summary questions -- different for explain vs motivate groups?

	Group 2 (Explain)	Group 3 (Motivate)
# of students	76	74
Total # of attempts for summary question	128	95
Avg. # of attempts for summary question	1.684	1.284

2. Dropping "guessers" -- where should we set the cut-off (20? 30?)







- I started with what we had before, 20, and played around with the t-tests.
- I also decided to use 14, since it is reasonable number. We can see that the frequencies went to the minimum number the first time, at around 14 times for all 3 scenarios.
- However, 16 can be a good cut-off for S2, since for getting 4 choices right, the maximum number of combinations there is is 16. Yet, I gave up on this idea, since I am not sure what to put as a reasonable S1's cut-off.

3. S1 vs S2, group by group improvement in S2 score (for treated students, not expected for controls)

		Group 1 (Control)	Group 2 (Explain)	Group 3 (Motivate)
	# of students	72	80	78
	Total for pre-question	347	409	359
	Avg. for pre-question	4.8194	5.1125	4.6026
S1 (# of attempts for all choices correct)	Total for post-question	390	359	345
	Avg. for post-question	5.4167	4.4875	4.4231
S2 (# of attempts for 4 choices correct)	Total for post-question	282	275	266
	Avg. for post-question	3.9167	3.4375	3.4103

4. **Looking at the Q5's, how many people take it seriously vs. junk, especially by group.**

	Group 2 (Explain)	Group 3 (Motivate)
# of students	76	74
Total # of serious submissions	128	95
Total # of serious attempts	88	71
Total # of junk attempts	40	24

5. **Write a report**

Course selection

We have selected the course "CSC209: Software Tools and Systems Programming" from University of Toronto to conduct our research. It is a course learning software techniques in Unix environment using language C. It is a prefect choice, since it is using an online tool called PCRS to give student lab exercises every week before lectures and we already have the permission for the anonymous student data to run this quick study. The exercises are typically a combination of videos, multiple choices and short answers. The study took place in the lab exercise of Week 9 and on the topic of Signal Handlers.

Participants

A total of 230 students participated in the study. They were assigned to three treatment groups based on which of the three sessions they were enrolled in for the course, and there are about 80 students in each treatment group.

Design

This study is conducted during the pre-lecture lab exercises for the week 9 of CSC209. The lab exercise starts with a video on the introduction to signals and followed with a pre-test multiple choice question. Then, the participants watch another video on the basic concepts of signal handling following with four code-tracing short answer questions. After that, the participants will either do not receive this part and continue to the next question, or answer one of the hypothesis questions below, designed for their treatment groups. The final question is a post-test multiple choice question.

The multiple choice questions consist of six choices and the participants need to select all the true statements for the questions. The code-tracing short answer questions are all based on the same piece of code but four different scenarios on when a signal could have interrupted. The students required to fill in the correct outputs.

All the instructions of the questions are on the exercise page; the students are expected to be able to proceed without directions.

Hypotheses

We designed three sets of exercises for three treatment groups and these are the variations among them regarding the effects of writing summaries on lab exercises:

(1) No question (between pre- and post- exercises, the control group).

(2) "For each of the 4 previous scenarios, write one sentence that explains why the program generates the output that it does."

(3) "For each of the 4 previous scenarios, write one sentence that explains why the program generates the output that it does. We aren't going to mark on the quality of your explanations, but we believe that writing them will help you learn this material and make the later questions (here and on the exam) easier."

Method of Study

We decided to study the resulting data for the pre- and post-test multiple choice questions with three approaches:

S0: measure the percentage of the students will answer them correctly on their first attempt.

S1: measure average the number of attempts for students to answer the entire questions correctly.

S2: measure the average number of attempts for students to answer part of the post-test questions correctly (of the 6 choices in the post-test, only 4 of them were directly related to the information provided from the 2 previous videos).

		Group 1 (Control)	Group 2 (Explain)	Group 3 (Motivate)
	Avg. for pre-question	4.8194	5.1125	4.6026
S1	Avg. for post-question	5.4167	4.4875	4.4231
S2	Avg. for post-question	3.9167	3.4375	3.4103

The result of S1 does not seem to show us whether the hypothesis questions are making a difference in the student response. However, if we take a look at S2 and focusing on the correctness of the choices related to the videos the student watched earlier, we can see that the results have improved significantly. The average number of attempts dropped at about 0.903~1.675 for the post-test questions.

	Group 2 (Explain)	Group 3 (Motivate)
# of students	76	74
Avg. # of attempts	1.684	1.284
# of serious attempts	88	71
# of random attempts	40	24

In addition to above, we also studied the student reponses from the "writing summary" questions. The "motivate" question did not seem to encourage more of the students writing a summary, comparing to an "explain" question. On the other hand, about 95% of the student answered the questions and about 68.8% and 74.7% (for the 2 groups) attempts were serious answers, instead of random place-holders.