AIR MAIL

Essay 2: Experiment Proposal

Research Question

What is the causal effect of the note taking method on memory and retention of material?

Rationale & Background

Existing research on this topic suggests a positive relationship between taking notes by hand on memory and retention of information. However, analysis to-date has addressed the relationship through observational studies, rather than an experimental design for causal inference[1]. Studies have shown evidence of a strong correlation between handwritten notes and attention. However, these studies fail to adequately control for unobserved confounding variables which may lead people who choose to take notes by hand being systematically different from people who choose to take notes by typing digitally.

Experimental Intervention and Treatment

In order to quantify the causal effect of note taking method on memory and retention, a laboratory experiment will be conducted that mimics the real-world setting, and those conducted in past observational studies on note taking. The experiment will take place in a semi-controlled classroom setting and follow the methodology outlined in Mueller and Oppenheimer's 2017 study wherever possible. Participants will be prescribed a Treatment of taking notes by hand, or prescribed to control of taking notes digitally. Consistent with previous studies, participants will watch a TED video lecture and complete a multi-question survey on the video content after having watched the video. The score on the survey would be the measured outcome, as a proxy for memory and retention of video content.

Randomization

Participants will be assigned to treatment and control at random, given their pre-experiment note taking preference. This random assignment will be done using a generator, and ensuring that participants are of approximately equally sized blocks. Blocking will be used to control for users preferred note taking habits, prior to conducting the experiment. Using blocking for random assignment is important to address research gaps in previous observational studies, which fail to account for sample differences between participants.

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[1] https://www.npr.org/2016/04/17/474525392/attention-students-put-your-laptops-away

An outstanding question from past studies has been if users who take notes by hand systematically different from those who take notes electronically. Blocking will allow us to compare the two groups, and evaluate differences between note taking styles, and address any unobserved confounds through random assignment. After participants have been split into preferences of handwriting and digital, the participants will be randomly assigned a treatment and control within those blocks; ensuring balanced classes of treatment and control within each block. Blocking will allow us to compare the two groups.

Additionally, blocking would serve as a marker of our pre-analysis research hypothesis and intent of analysis, that users who preferred note taking method (choose treatment) may be systematically different from those who don't. When analyzing data, we will be-sure to present analysis as subheadings by block, to ensure that we don't aggregate data in ways that are unrepresentative of the average treatment effect across the population as a whole.

Participants will be recruited from undergraduate and graduate students on UC Berkeley campus. Each participant will complete an input survey, where they are asked if they prefer taking notes by hand or on a computer. Based on the intake survey responses, participants will be split into two blocks- those who prefer taking notes by hand and those who prefer taking notes digitally. Within each block, students will be randomly assigned to treatment (handwritten note taking) and control (digital notetaking). Students will then watch the 15-minute video and complete a post-treatment survey to analyze their memory and retention.

Assessment of Outcomes

Outcome of interest is memory and retention of information. For a laboratory setting, the treatment will follow the methods prescribed by Oppenheimer et al, in which a series of multi-choice questions are asked on the material with which participants were asked. Responses will be scored, with 1 point per question, and the average scores compared to assess the causal treatment effect of the intervention.

Secondary outcomes to consider would be more broad understanding or ability of participants to extrapolate material. Participants ability to recall certain facts about the material may be different depending on note taking method, as there is a longer time period of interaction with the content. Past research has hypothesized that handwritten notes may be preferable for synthesizing content, where digital note taking with faster words per minute recording may be preferred for recording facts. The secondary outcomes of participants ability to synthesize, as another impact measure of memory will be assessed following the methodology of Oppenheimer et al, with several short response questions that extrapolate upon content.

References

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