Distraction Demotivates

What impact does a high level of distraction have on students attending live online class lectures?

The Marshmallow Test

In the 1960s, children in preschool were put inside a room with a marshmallow in front of them. If they did not eat the marshmallow, they would get a bigger one when the researcher returned. Some children ate it as soon as the door was closed, while others managed to wait. This was the famous Marshmallow Experiment conducted by a Stanford professor to see if the ability to delay gratification was present in children (Mischel, 2014).

Fast forward to online classes during the pandemic, and students face a new marshmallow: their smartphones. Students now divide their attention to multiple streams of information and entertainment during lectures in class (Paul, 2020). For this paper, I would introduce "distraction" as a term that describes something that slows down and essentially diverts another process in the form of external sensory stimuli such as noise, vibrations, and light signals produced by digital devices (Clapp & Gazzaly, 2012). Distractions lead students to do off-task (unrelated to class) work (Aivaz & Teodorescu, 2022). With this unregulated behavior, the paper asks, **"What impact does a high level of distraction have on students attending live online class lectures?"**

This paper presents the results of an analysis of a sampled dataset from Nguyen et al. (2020) that compares the experiences of students in online classes versus in-person classes. The study uses a Likert scale, with responses ranging from strongly disagree (1) to strongly agree (5), to evaluate students' opinions on various aspects of their experiences in online and in-person classes. The dataset contains responses from a total of 465 students who were attending classes in a variety of settings, including live online classes, recorded online classes, and in-person classes. The data was collected during the early stages of the COVID-19 pandemic when many schools and universities were transitioning to online learning due to the restrictions on in-person gatherings.

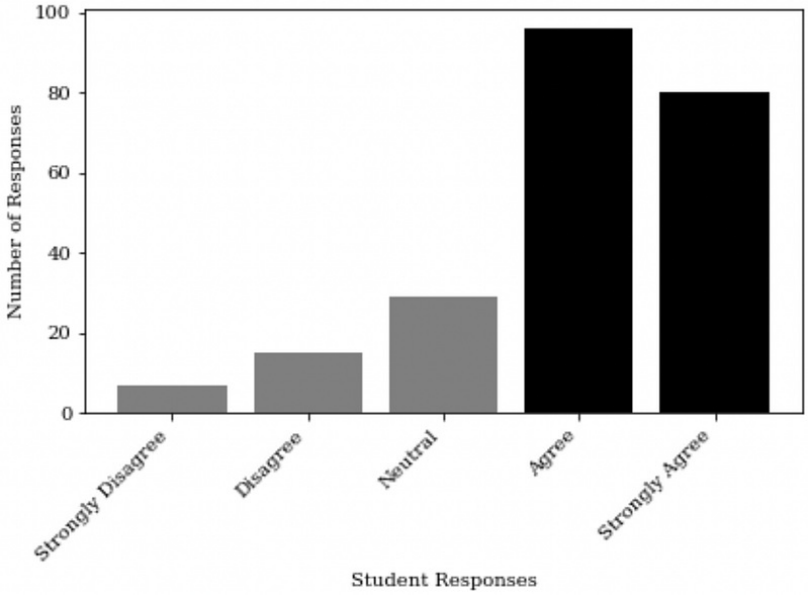

Figure 1. Responses for Distractedness in Live Online Class sessions. This histogram shows the distribution of student responses to the question, "How often do you feel distracted during online classes?" The responses were collected from the filtered sample of 212 and are shown in a histogram.

To develop the presented research question, I narrowed down the responses where the primary teaching mode is "Live classes" or synchronous class sessions. Zoom or Google Meet holds them. I indicated the students who were distracted in online classes by looking at the responses from the statement "I am often distracted during coursework or attending classes" and seeing how many students agreed, which resulted in 176 out of 212, or 83%, of the students in the sample set. This analysis will continue by analyzing the responses of the filtered 176 students.

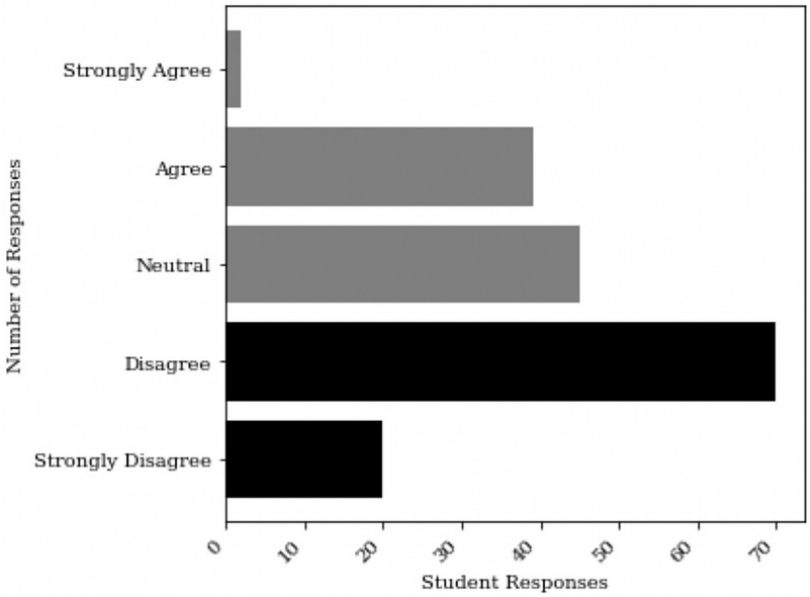

Figure 2. Responses on Motivation. This histogram shows the distribution of student responses to the question "I feel motivated to learn." who also responded "agree" and "strongly agree" on being distracted. The responses were collected from the filtered sample of 176 and are shown in a histogram.

Building on this, I hypothesize that if a student is distracted, then they will have lower motivation levels because task-switching consumes cognitive resources and lowers mental energy. This hypothesis is supported by additional filtering and the discovery that 51% (90) of the sampled responses indicated a lack of motivation to learn.

Distractions can harm a person's motivation in several ways.

First, when a person is distracted, their ability to focus on a task is reduced, which can make the task feel less enjoyable. This can lead to decreased motivation because the person may feel less invested in the task

and less motivated to continue working on it (Goldhill, 2016). Multitasking, better defined as task-switching, has been shown to negatively impact the brain's ability to regulate its use of glucose, the brain's primary fuel source. When a person is task-switching, their brain has to work harder to switch between tasks, which can lead to a decrease in glucose levels and a reduction in mental energy. This can lead to a decrease in motivation because the person may feel fatigued and less able to focus on the task at hand (Harvard Medical School, 2016).

This research fills a gap in the existing literature by exploring the specific effects of distraction on motivation in the context of live online classes. The findings of this study may be useful for educators and policymakers in developing strategies to support students and improve the effectiveness of online learning.

To best test this hypothesis, I will conduct an interventional study using a randomized controlled trial (RCT) design to investigate the impact of distractions on motivation in an online academic setting. In this study, classes in a school will be randomly assigned to either a control group or an experimental group, with two to three classes per group. Participants in the experimental group will be exposed to various distractions during a live online class, while the control group will not be exposed to these distractions.

To collect data, I plan to use a combination of objective measures for distractedness and self-report measures for motivation. For the objective measures, I will track the number of times participants switch between tasks and the amount of time they spend on each task. This will be done with the consent of the class and will be tracked using software that can monitor the state of the participants' tabs, but not look at the content of their newly-switched tabs, and cameras to determine if they are listening to the class or are checking their mobile phones.

For the self-report measures, I will use questionnaires that ask participants to rate their level of motivation. These questionnaires will be based on Tillery's scholarly guide on measuring motivation (2014). They will include questions about participants' level of interest in academics online, their goals and aspirations, their beliefs and attitudes towards academics online, and their subjective experiences while engaging in academic activities online. I will coordinate with professors to survey in the last 10 minutes of the class so that the experimental groups' responses will reflect their experiences of distractedness. By collecting this information through self-report measures, I will gain insight into the participants' subjective experiences and attitudes toward motivation in an online academic setting.

The strength of this approach lies in its design. The information from the time-tracking test can be used to enrich the analysis of the participants' qualitative survey responses, providing a more comprehensive understanding of the relationship between distractions and motivation. This information will be used to compare the control and the experimental groups and assess the impact of distractions on motivation. This will help me draw specific conclusions about the relationship between the two variables and inform future research on this topic.

Observational studies cannot provide the same level of control over the conditions of the experiment, such as an accurate measure of motivation, leading to less precise estimates of the effects of distractions on motivation. Therefore, using an experimental design would be a more appropriate approach for testing the effects of distraction on motivation in my study.

One potential limitation of this approach is that the results may not generalize to all students, as the sample would be limited to a specific group of participants. Additionally, there may be other factors that impact motivation that is not accounted for in this study, such as individual differences. To address these limitations, it would be important to conduct further research with a larger and more diverse sample of participants.

An expected outcome consistent with my hypothesis is that participants in the experimental group would have lower levels of motivation compared to the control group due to higher levels of task-switching. This would be indicated by lower scores on self-report measures of motivation and a decrease in the amount of time spent on the online class session tab.

An outcome not consistent with my hypothesis is that there is no motivation difference between the experimental and control groups. This would suggest that distractions do not harm motivation in this context. It would also make room for improvement on the other variables that may affect the study, such as a student's feelings towards the subject or simply their mood at the time of the experiment.

Regardless of the specific results, this study would further our understanding of the effects of distractions on motivation in the context of live online classes. This information will be useful for educators and policymakers in developing strategies to support students and improve the effectiveness of online learning. For example, if the results support the hypothesis. In that case, educators may want to implement strategies to minimize distractions during online classes, such as setting aside dedicated times for students to check their phones or providing tips on managing distractions.

Reflection

I improved the clarity of my data visualization by changing it from a pie chart to a bar graph. This was based on feedback that pie charts are

difficult to interpret accurately, especially when the slices are not at 0%, 25%, 50%, 75%, or 100% (Few, 2007). I also learned that pie charts do not allow for easy comparison of the magnitude of each slice, which can be done with bar graphs. Through this, I realized that coding the data visualizations to tailor-fit it into my study will significantly help in making my point easier to understand. This is because the charts produced by Google Sheets are hard to customize. This change made it easier to interpret the data and see the gaps in the responses more clearly. The y-axis now includes text labels that provide more information. Overall, this change improved the effectiveness of the visualization in communicating the data. You can view the code here.

Appendix

The code I created for the first DataViz # 1

```
import pandas as pd
import matplotlib.pyplot as plt

# read the csv file into a pandas DataFrame
df = pd.read_csv("SoL_wMotivate.csv", header=None)
# create a list of the responses categories
categories = ["Strongly Disagree", "Disagree", "Neutral", "Agree", "Strongly Agree"]
# create a list of the counts for each response category
counts = [
 (df[2] == "Strongly Disagree").sum(), (df[2] == "Disagree").sum(),
 (df[2] == "Neutral").sum(),
 (df[2] == "Agree").sum(),
 (df[2] == "Strongly Agree").sum()
]
# set the figure size and aspect ratio
plt.figure(figsize=(6, 4.5))
# create a horizontal bar chart using matplotlib
plt.barh(categories[:2], counts[:2], align="center", color="black") plt.barh(categories[2:], counts[2:], align="center", alpha=0.
# add labels and title
plt.xlabel("Student Responses") plt.ylabel("Number of Responses")
# style to improve readability
plt.xticks(rotation=45, ha="right") plt.tight_layout() plt.rcParams["font.family"] = "serif"
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# show the plot
plt.show()
```

The code I created for the first DataViz # 2

```
import pandas as pd
import matplotlib.pyplot as plt

# read the csv file into a pandas DataFrame
df = pd.read_csv("SoL_wMotivate.csv", header=None)
# create a list of the responses categories
categories = ["Strongly Disagree", "Disagree", "Neutral", "Agree", "Strongly Agree"]
# create a list of the counts for each response category
counts = [
 (df[2] == "Strongly Disagree").sum(), (df[2] == "Disagree").sum(),
 (df[2] == "Neutral").sum(),
 (df[2] == "Agree").sum(),
 (df[2] == "Strongly Agree").sum()
]
# set the figure size and aspect ratio
plt.figure(figsize=(6, 4.5))
# create a horizontal bar chart using matplotlib
plt.barh(categories[:2], counts[:2], align="center", color="black") plt.barh(categories[2:], counts[2:], align="center", alpha=0.
# add labels and title
plt.xlabel("Student Responses") plt.ylabel("Number of Responses")
# style to improve readability
Scientific Proposal - Part 2 14
plt.xticks(rotation=45, ha="right") plt.tight_layout() plt.rcParams["font.family"] = "serif"
# show the plot
plt.show()
```

References Used

Aivaz, K. A., & Teodorescu, D. (2022). College students' distractions from learning caused by multitasking in online vs. face-to-face classes: A case study at a public university in Romania. *International Journal of Environmental Research and Public Health*, *19*(18), 11188.

https://doi.org/10.3390/ijerph191811188

Bates, A. (n.d.). *Almost Everything You Wanted to Know About Making Tables and Figures*. HOW TO WRITE GUIDE: Making tables and figures. Retrieved December 4, 2022, from https://web.archive.org/web/20210321215810/http://abacus.bates.edu/~ganderso/biology/resources/writing/HTWtablefigs.html

Clapp, W. C., & Gazzaley, A. (2012). Distinct mechanisms for the impact of distraction and interruption on working memory in aging. *Neurobiology of Aging*, *33*(1), 134–148. https://doi.org/10.1016/j.neurobiolaging.2010.01.012

Few, S. (2007). *Save the pies for dessert—resource*. BetterEvaluation. Retrieved December 4, 2022, from

https://www.betterevaluation.org/en/resources/overview/save_the_pies_for_dessert

Goldhill, O. (2016, July 3). *Neuroscientists say multitasking literally drains the energy reserves of your brain*. Quartz. Retrieved December 4, 2022, from https://qz.com/722661/neuroscientists-say-multitasking-literally-drains-the-energy-r eserves-of-your-brain

Scientific Proposal—Part 2 11

Harvard Medical School. (n.d.). *Sugar and the brain*. Harvard Medical School. Retrieved December 4, 2022, from

https://hms.harvard.edu/news-events/publications-archive/brain/sugar-brain Morrison, K. (2020). Design issues in randomized controlled trials. *Taming Randomized*

Controlled Trials in Education, 126–136. https://doi.org/10.4324/9781003042112-8

Nguyen, T., Netto, C. L., Wilkins, J. F., Bröker, P., Vargas, E. E., Sealfon, C. D., Puthipiroj, P., Li, K. S., Bowler, J. E., Hinson, H. R., Pujar, M., & Stein, G. M. (2021). Insights into students' experiences and perceptions of remote learning methods: From the COVID-19 pandemic to best practice for the future. *Frontiers in Education*, *6*. https://doi.org/10.3389/feduc.2021.647986

Paul, A. M. (2013, May 3). *The new marshmallow test: Students can't resist multitasking*. Slate Magazine. Retrieved December 4, 2022, from https://slate.com/technology/2013/05/multitasking-while-studying-divided-attention -and-technological-gadgets-impair-learning-and-memory.html

Touré-Tillery, M., & Fishbach, A. (2014). How to measure motivation: A guide for the experimental social psychologist. *Social and Personality Psychology Compass*, *8*(7), 328–341. https://doi.org/10.1111/spc3.12110

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