Behavioural consequences of reminder emails on student performance: a real-world deployment

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Abstract

As online learning has become a new norm during the COVID-19 pandemic, it is more difficult for instructors to monitor progress and motivate students.
We designed and implemented a real-world randomized A/B experiment to send emails to students reminding them about their online homework, in an effort to reduce procrastination and increase student performance.
In this poster, we will discuss the impact of reminder emails on student motivation to attempt and complete homework, and analyze if it prevents students from procrastinating and results in students starting earlier and performing better.
Also, we will discuss the limitations of our deployment and how we can generalize it to a broader context.

Background / Context

- Procrastination is a prevailing phenomenon among college students. Research has estimated that approximately 80% to 95% of college students engage in procrastination [2, 4]. Moreover, studies have found a strong negative correlation between procrastination and student performance [7].
- The phenomenon of procrastination has become more prevalent in the online learning environment due a decrease in students' effort regulation and intrinsic motivation to learn [5]. Therefore, it is crucial to implement the randomized A/B reminder messages to keep students on track. Email reminders will be randomly sent on Tuesday or Thursday, and the effects of the timing of the emails will be investigated.
- According to research on last minute marketing, there is an increasing trend that firms in the travel and tourism industry focus more on providing services to customers seeking last-minute opportunities [1]. This caters to the mentality that people are more open to marketing education and ideas in urgent situations.

Method of Analysis

When will you do this week's homework? How can you start earlier than last week?

Hi <*Student Name*>,

The homework is due by <*Deadline*>. Please take a moment to think about the following prompts:

When will you do this week's homework? How can you start earlier than last week?

Some students find it valuable to just open up the online homework system and spend a minute on a problem, because it helps them visualize what they need to do. So you might remember to do it later!

Could you spend 5 minutes on the homework now?
tiny.cc/<*Homework Number*>

<*Course Code*> Learning Support Team

Figure 1: Example of email reminder

- To measure how much of an impact reminder messages have on students, we have sent reminder emails to test our hypothesis. We deployed the reminder messages during the Winter 2020 semester of Introduction to Programming (CSC108). Our deployment was done in week 5, 6, 7, 8, 11 and 12 within the second semester; for this poster, we will focus on week 6 in particular as this week hasn't been analyzed before.
- In Week 6, we sent reminders for students' weekly exercises. To test students' behaviour change due to email reminders, we randomly divided students into a control group (no email, 24.84%, n = 235) and treatment group (receive email, 75.16%, n = 711). Within the treatment group, we have randomized which day (Tuesday vs. Thursday) they will receive the email.
- In addition to understanding students' perceptions and experiences on receiving those messages, we also conducted a survey to allow students to express their ideas on receiving those reminders.
- In this poster, we will focus on answering two main questions:
  1. Are reminder emails really effective?
  2. On what day of the week are reminder emails more effective than others?

Intervention Results

- Students who received the reminder emails generally shows positive impressions. [Figure 2].

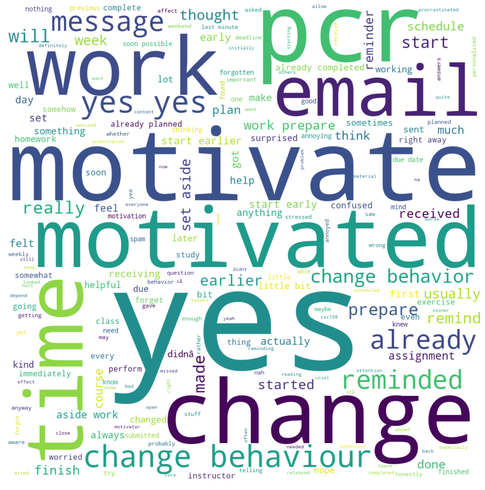

Figure 2: Word Cloud generated from students' feedback using Python's WordCloud, STOPWORDS, and ImageColorGenerator packages.

- The graph shows that the attempt rate for students in the treatment group increases after the reminder emails are sent in Tuesday and Thursday. The p-value(0.49947) is not statistically significant. [Figure 3].

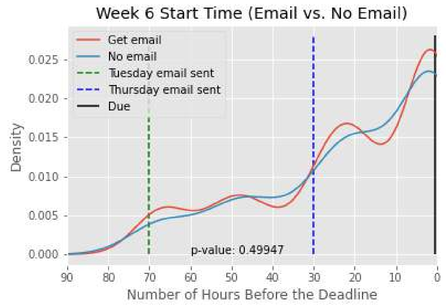

Figure 3: Density of the time of the first attempt (hours before the deadline) across students who received a reminder or not. Two dash lines indicates the time when the emails were sent.

- Students who received the reminder emails performed better in the midterm. The p-value (0.00796) is statistically significant [Figure 4].

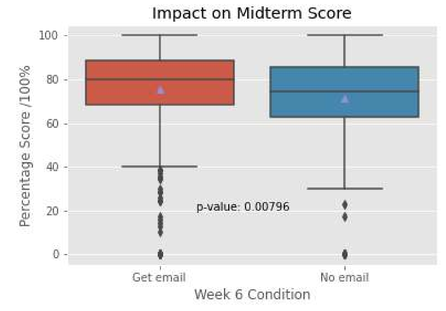

Figure 4: Boxplot of the midterm scores (%) between control group and treatment group.

- The Tuesday email treatment group attempts more after receiving the email, similarly for the Thursday email treatment group. The p-value (0.80293) is not statistically significant. [Figure 5].

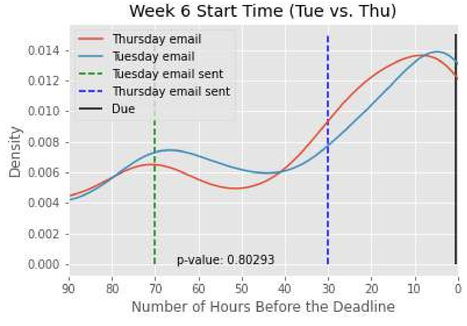

Figure 5: Density of the time of first attempts for emails sent on Tuesday, and emails sent on Thursday.

- In terms of the effects on the last submission time, the p-value (0.40273) is not statistically significant. [Figure 6].

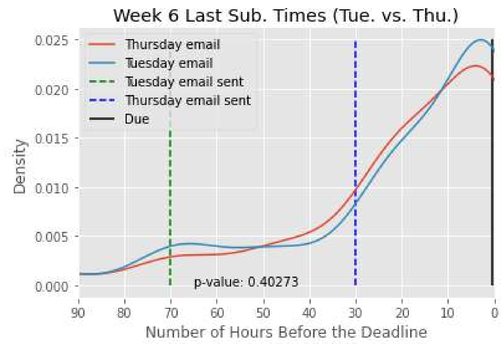

Figure 6: Density of the time of last attempts for emails sent on Tuesday, and emails sent on Thursday.

Limitations and Future Work

- We would like to deploy our experiment in new settings because students in a different setting may have different behaviour. For example, science stream students have significantly higher achievement motivation compared to arts stream students [6], graded homework increases students' incentives to actually do assignments [3]
- For future work, we will add more versions and design more personalized emails depending on students behaviour, to achieve the optimal influence on students' motivation and minimize the procrastination.

References

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