Does Nudging Students Decrease Learning Deficits and Dropouts During and After a Pandemic? Experimental Evidence from Covid-19 Responses in Brazil

Pre-analysis Plan

The covid-19 pandemic has forced 1.5 billion schoolchildren in 160 countries to stay at home while schools were shut down on sanitary grounds. While several distance learning tools have been put in place in developing countries, a variety of factors raise critical concerns about learning deficits and school dropouts when schools are back, particularly amongst the most vulnerable students. This paper investigates whether sending reminders and encouragement messages to high-school students in Brazil during the pandemic increases attendance and assignment completion when it comes to distance learning, and decreases grade repetition and dropout rates in the aftermath.

I. Introduction

The covid-19 pandemic has forced 1.5 billion schoolchildren in 160 countries to stay at home while schools were shut down on sanitary grounds. Brazil is no exception. The nationwide decision to shut down schools for almost the entirety of the 2020 school year in order to limit the spread of the covid-19 pandemic has forced all schools to switch to distance learning. Such rapid transition, combined with a mismatch between delivery channels and access conditions – as several State Secretariats of Education switched to online, while nearly 70 million households have no or only precarious access to internet –, are expected to severely impact learning, and potentially lead to a spike in school dropouts (Brookings, 2020; World Bank, 2020).

Schools have been trying to keep contact with their students by sending personal letters via post or by creating an online platform with tools that students can use. However, the attendance of the students, whether on the platform with the online tools or at school to pick up printed class material, is reported to be remarkably low. São Paulo State has reported that only 50% of its 3.5 million students are accessing the online learning platform daily as expected.[1]

With the goal of increasing engagement in distance learning – and, particularly, online attendance and assignment completion – during the pandemic, as well as limiting its effects on learning gaps and school dropouts once schools are back, the Goiás State Secretariat of Education is testing various strategies in

[1] The State Secretariat also broadcasts content on television. It is much harder to gather data on the share of students following classes on this format daily.

partnership with Instituto Sonho Grande.[2] As part of those strategies, they are interested in evaluating nudges (reminders and encouragement messages) sent twice a week to high school students, directly on their mobile phones via text messages (SMS). Towards that goal, they have hired Eduq+, an educational nudgebot that has been shown to improve educational outcomes (during normal times) in Brazil and Ivory Coast.

Eduq+ nudges users twice a week with motivating facts and suggested activities to engage them in the daily school life. It also allows schools to broadcast messages to all users weekly. The intervention has been evaluated in the context of regular schooling, targeted at parents of primary school children. The nudgebot has been shown to promote large impacts on school attendance, test scores and grade promotion rates (Bettinger et al., 2020), and to decrease school dropouts by 50% across multiple primary grades (Lichand and Wolf, 2020).

The version of Eduq+ to be evaluated in this study is, however, different from that in those studies, since nudges will be sent directly to students themselves.[3] Moreover, the context of distance learning is also much more challenging. Whether the intervention is still able to improve educational outcomes under those conditions is an empirical question.

This pre-analysis plan summarizes the design of a field experiment to test the following primary hypotheses:

1. Does nudging students increase usage of online learning tools by high school students?
    - Hypothesis: SMS nudges increase the share of students who access the online platform daily, and the share of students who hand in assignments (online or not).
2. Does nudging students mitigate the negative effects of the school shutdown on learning outcomes?
    - Hypothesis: SMS nudges improve attendance and grades, and decrease grade repetition and dropouts once face-to-face classes resume.

II. Intervention and experimental design

The intervention has been designed by Instituto Sonho Grande and the Goiás State Secretariat of Education, with the help of Movva (the implementing partner that powers Eduq+).[4] It will take place during the months of June and July/2020, when public high schools will be randomly assigned to have their students receive two messages per week from Eduq+. 57 schools have been assigned to the treatment group, and 30 to the control group (which receives no intervention). Randomization is stratified by gender, grade and phone ownership. In case the student does not own a phone, messages will be sent

[2] Goiás a relatively poor state located in the Center-West region of Brazil. Instituo Sonho Grande is a non-profit organization committed to improving high-school educational outcomes in Brazilian public school.
[3] In case they do not have their own phone, messages will be sent to the mobile phone of their primary caregivers.
[4] One of the authors (Guilherme) is a co-founder and chairman at Movva (http://movva.tech).

to the mobile phone of his/her primary caregiver. The intervention is scheduled to be rolled out on June 9th.

Table 1: Randomization strategy - Treatment vs. Control

Treatment	Control
57 schools 12,056 students	30 schools 6,200 students

Table 1 above summarizes the randomization strategy for the first phase of intervention. Within the sample of 12,056 students assigned to receive nudges, less than half (5,188) own their own mobile phone and will receive messages directly. It is also important to note that not all students in the sample have access to the internet and that those who do not can pick up the printed class material once every week and hand in assignments the following week. For the purpose of this study however, we will be able to measure their outcomes in different ways.

At the end of July, we will be able estimate treatment effects on access to the online platform, and assignment completion, from administrative data provided by the Secretariat. Concretely, we have requested weekly student-level data on log in activity – or face-to-face pick-up of class materials – as well as assignment completion (again, online or offline). For those with online access, we hope to get access to daily data, which would allow us to also estimate high-frequency treatment effects through event studies. Last, after face-to-face classes resume, we will have access to administrative records on student-level attendance, grades, grade repetition and enrollment status.

The interpretation of these long-term effects will vary depending on the choice made by the Education Secretariat to continue or not the intervention after short-term results are made available. Depending on the short-term impacts of the nudges, the Education Secretariat might decide to keep testing Eduq+ for a longer period, to scale it up or to scale it down. As such, three scenarios can emerge after the first phase of the intervention: (1) the intervention continues for a longer period, keeping the treatment assignment fixed; (2) the control group starts receiving the nudges; or (3) the treatment group stops receiving the nudges. In case (1), long-term effects will reflect a combination of nudges sent during and after the school shutdown; in case (2), long-term effects will only reflect differences in the intensity of the treatment; and in case (3), long-term effects will capture persistence of treatment effects (if any).

With the number of schools and the number of students presented in Table 1, and assuming an intra-cluster correlation of 0.16 (SARESP, 2014a, 2014b) as well as conservative variance estimation for binary outcomes (assuming that 50% of students access the online platform and hand in assignments, in the control group)-, we could detect treatment effects of at least 0.8 percentage points on those outcomes[5].

[5] These power calculations have been computed by clustering at the school level.

Since the typical treatment effect of nudges on binary decisions is 1.7 percentage points (Dellavigna and Linos, 2020), we conclude that the design is well powered to detect relevant short-term effect sizes.

III. Outcomes

We will document the effects of the treatments on the following categories of outcomes for students enrolled in high school (age 15 to 18):

A. Short-term outcomes: probability of logging into the online platform or picking up the material in school, probability of handed in of assignments, as measured by administrative records;

B. Long-term outcomes: attendance, grades, probability of grade repetition and probability of dropout, as measured by administrative records.

Since some students will receive messages on their own mobile phones, while for others it is their caregivers who will be nudged by Eduq+, we will estimate treatment effects within those two subgroups. Power calculations indicate that we could detect treatment effects of at least 1 and 0.9 percentage point for these two subsamples, respectively.

Since there are siblings in the data, we will remove from the main analysis cases when not all siblings are assigned to the same treatment conditions. Depending on how many siblings there are, we also plan to estimate within-family's externalities of the nudges, taking advantage of that sub-sample.

IV. Empirical analysis

Since the intervention is randomly assigned, comparing treatment and control groups yields treatment effects of the SMS nudges on the outcomes of interest (Section III). Using ordinary least squares regressions, we will stimate:

$$Y^{j}_{smi} = \beta_0 + \beta_1 T_{sm} + \theta_s + u_{smi}$$

Where:

- Y^{j}_{smi}: Outcome variable j for student i at school m and stratum s;
- T_m: Indicator variable equal to 1 if students I in school m and stratum s is assigned to receive SMS nudges, 0 otherwise;
- θ_s: stratum fixed effects.

We cluster standard errors at the school level, since that is the level at which the intervention is randomly assigned. We are interested in testing $\beta_1 = 0$.

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