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Let's Chat: Leveraging Chatbot Outreach for Improved Course Performance

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Abstract

Despite documented benefits to college completion, more than a third of students who initially enroll in college do not ultimately earn a credential. Completing college requires students to navigate both institutional administrative tasks (e.g., registering for classes) and academic tasks within courses (e.g., completing homework). In postsecondary education, several promising interventions have shown that text-based outreach and communication can be a low-cost, easy to implement, and effective strategy for supporting administrative task navigation. In this paper, we report on two randomized controlled trials testing the effect of a text-based chatbot with artificial intelligence (AI) capability on students' academic task navigation in introductory courses (political science and economics). We find the academic chatbot significantly shifted students' final grades, increasing the likelihood students received a course grade of B or higher by 5-6 percentage points and reduced the likelihood students dropped the course.

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INTRODUCTION

Despite documented benefits to college completion, more than a third of students who initially enroll in college do not ultimately earn a credential (Snyder and Dillow 2015), and striking inequalities in college completion exist along socioeconomic and racial lines (Holzer and Baum 2017; Kena et al., 2014; Ma, Pender & Welch, 2019). Gaps in college persistence and completion persist even among students with similar academic achievement and preparation in high school (Belley & Lochner, 2007; Kena et al., 2014; Long & Mabel, 2012; Ma, Pender & Welch, 2019). Colleges have invested in several resource-intensive interventions to increase college persistence, including providing students with additional financial aid (Castleman & Long, 2016; Page et al., 2014), enhanced advising (Bettinger & Baker, 2014), or the combination of wraparound advising and financial assistance (Clotfelter, Hemelt, & Ladd, 2018; Scrivener et al., 2015; Weiss, Ratledge, Sommo & Gupta, 2019).

Increasingly, policymakers, educators, and researchers have focused on how informational barriers and administrative hassle factors have stymied students' pathways to graduation. Completing college requires students to navigate both institutional administrative tasks (e.g., registering for classes, applying for, and accepting financial aid) and academic tasks within courses (e.g., completing homework and submitting assignments). In postsecondary education, several promising interventions have shown that text-based outreach and communication can be a low-cost, easy-to-implement, and effective strategy for supporting educational attainment and guiding students through complex administrative processes. In addition to evidence that text-based communication can facilitate the likelihood students initially enroll in college (Castleman & Page, 2015, 2017; Castleman, Page & Schooley, 2014; Page, Castleman & Meyer, 2019), research shows that the same low-touch virtual outreach can also help college students to complete required institutional administrative tasks at higher rates and persist longer in college (Castleman & Page, 2016; Page, Meyer, Lee, & Gehlbach, 2023).

It is an open question whether institutions can leverage these same communication strategies to improve students' core academic experiences in college. More specifically, can nudges affect academic *inputs*, such as studying and assignment completion, in a way that translates into meaningful *outputs*,

such as course performance and retention? Oreopoulos and Petronijevic (2019) found limited effects of a suite of low-touch psychological and nudge interventions on college student outcomes. While they found improvements to student mental health and increases in study time (academic input), those proximal effects did not translate into higher course grades or credits earned (academic output). Other interventions have found that email outreach (ostensibly sent from a course instructor) can effectively increase students' academic inputs (completing additional practice problems), though those efforts also did not translate to increases in course grades (Pugatch & Wilson, forthcoming). In contrast, recent work found that targeted email messages with assignment reminders, encouragement to attend office hours, and notes about current course performance sent directly from a student's professor led students to perceive their professor more positively. Further, the outreach led underrepresented minority students to earn higher grades in the course and ultimately to graduate from college at higher rates (Carrell & Kurlaender, 2021). In another study, adding current course performance information to student communications from faculty – which provided students with regular reminders about their course standing – increased subsequent homework performance (Smith et al., 2018). These varied effects on course performance suggest that message design features – such as the sender or customization to student circumstances – are likely to be important factors in determining whether virtual outreach will meaningfully affect intermediary inputs and their subsequent academic outputs.

In this paper, we report on an effort to implement and experimentally test a text-based chatbot with artificial intelligence (AI) capability to provide course-specific, proactive outreach and support to students in large-enrollment undergraduate courses. Since 2016, Georgia State University (GSU) has engaged in a research-practice partnership involving university staff, external researchers, and Mainstay, a technology company, to design, build, and investigate the potential of artificially intelligent virtual communication tools (e.g., "chatbots") to support students to and through college.[2] GSU uses the chatbot to communicate with students through the persona of Pounce, the university's blue panther mascot.

[2] For more information on Mainstay, formerly AdmitHub, see www.mainstay.com

Studies to date have found that the chatbot improved first-year enrollment (Page & Gehlbach, 2017) and the completion of tasks necessary for college persistence, such as handling registration holds and refiling the FAFSA (Page, Meyer, Lee, & Gehlbach, 2023). Given positive effects from these initial experimental studies, GSU has made chatbot communication regarding pre-enrollment and other required administrative tasks standard practice with all students who have opted into receiving text-based outreach. At GSU, all students can consent to receive text message communications from the school and are considered "text eligible" for subsequent outreach. About 86% of incoming students each term opt-in for text-based messaging.

In this study, we apply the same chatbot technology within the classroom at GSU with the goal of increasing students' course engagement and performance. To implement this academic chatbot, we drew on insights from GSU student experiences and prior literature to target courses in which the chatbot could be most impactful. We first identified courses with historically high "DFW" rates (DFW refers to a student who earned a D, F, or withdrew from a course). Next, we targeted large enrollment courses where students had fewer opportunities to connect individually with the instructional team or with peers to form academic support systems. Research on in-person college class size finds that student randomly assigned to larger in-person classes (compared to smaller in-person classes) earn lower grades (De Giorgi, Pellizzari, & Woolston, 2012), although the negative effects of large enrollment courses have not been found in experiments comparing online course size and student performance (Bettinger, Fox, et al., 2017). While there are few reliable sources of data on the share of students enrolled in large introductory courses for US college students overall, at GSU about 53 percent of students enrolled in at least one "high-enrollment" course of 100 students or more during the 2021-22 academic year. Students are substantially more likely to take a "high-enrollment" course during their first year – 72 percent of incoming freshmen did so during the 2021-22 academic year. Finally, we targeted online courses, hypothesizing that the chatbot could be especially beneficial to students enrolled in online courses who face similar barriers as students in large enrollment courses when attempting to connect with peers and instructors. In 2018, approximately 35 percent of US college students took at least some virtual/distance education courses

(NCES, 2019). Of course, this rate rose dramatically during the start of the COVID-19 pandemic as some 1,400 colleges transitioned to online instruction during the spring 2020 semester (Marsicano et al., 2020). Prior research finds that students completing online courses earn lower course grades by almost half a grade level (0.44 points) compared to students taking the same courses in-person; students learning online also are more likely to drop out of college after that semester (Bettinger, Doss, et al., 2017). More recent work also found students randomly assigned to online instruction during the COVID-19 pandemic earned lower final course grades and performed worse on both assignments and exams (Kofoed et al., 2021).

Given these target parameters, GSU identified two large enrollment, asynchronous online courses to empirically evaluate the effectiveness of an academic chatbot via randomized controlled trial. GSU first implemented the academic chatbot in a section of "Introduction to American Government." Nearly all students at GSU take the "Introduction to American Government" course to satisfy a state of Georgia graduation requirement[3], and the focal section of the course in this study enrolls the largest number of students each term. The course-specific bot was named "POLS Pounce" to mirror the main GSU "Pounce" bot.[4] Students received 2-3 scheduled, customized messages each week via text message from POLS Pounce, providing information on weekly assignment due dates, nudges to complete late/missing assignments, and encouragement and invitations to engage with the bot or instructional team with any questions. Customization took the form of *personalization* (e.g., "Hi FIRSTNAME") and *targeting* (e.g., messages differentiated for students who had a missing assignment versus students who were up to date on the readings).

Following implementation in "Introduction to American Government," GSU expanded the academic chatbot to multiple sections of "Principles of Microeconomics." This replication, also conducted as a randomized controlled trial over two semesters, enabled the research team to examine

[3] GSU students are only exempt from taking "Introduction to American Government" through examination (e.g., presenting Advanced Placement exam scores).

[4] Although the bot was named POLS Pounce and referred to as such on end-of-course survey, in practice the messages more often emphasized names of the instructional team (#tyler) and encouraged students to connect with the professor rather than POLS Pounce.

whether the academic chatbot yielded similar treatment effects across academic subjects and across instructors and to further investigate for which students and in what contexts the academic chatbot affected both academic inputs and outputs. At GSU, "Principles of Microeconomics" is a required course for economics and business majors and is one option for students to satisfy a core curriculum social science foundations requirement.[5]

Across the two courses, we find the academic chatbot significantly shifted students' final grades, increasing the likelihood students received a course grade of B or higher by 5-6 percentage points. The academic chatbot also reduced negative course outcomes in "Principles of Microeconomics," where the academic chatbot specifically reduced the likelihood students dropped the course by 3 percentage points. In subgroup analyses, we did not find evidence that first-generation or Pell-eligible students *differentially* benefited from the academic chatbot in either course, with similar treatment effects as their peers who were not first-generation or not eligible for the Pell grant. In the "Introduction to American Government" experiment we found that the bot affected students on different margins based on their prior academic achievement – for students with weaker academic backgrounds (e.g., re-taking the course, or lower high school GPA), the treatment effects were larger on whether students earned a passing grade, while for students with stronger academic backgrounds effects were larger on whether those students earned an A in the course. In "Principles of Microeconomics," the largest effects were for female students, with virtually no effect for male students. Ultimately, on end-of-course surveys, students reported enthusiasm for the chatbot, with 92 percent of respondents recommending its continued use in the course and expansion to other courses at GSU.

Our study makes three important contributions to the literature. First, we build on a growing body of evidence on the positive effects of virtual outreach on student success, providing more support for the hypothesis that such outreach can effectively improve student academic outcomes when integrated into

[5] Unlike "Introduction to American Government," which all students must pass or test out of, the "Principles of Microeconomics" course is one of 15 possible courses students could select to satisfy the social science foundations requirement.

students' courses and delivered by a trusted sender (in this case, from a course professor and teaching assistant[6]). Second, we translate these strategies to the college classroom, evaluating the extent to which strategies that have helped students successfully navigate administrative tasks at the institution level can similarly benefit students' completion of course tasks and course performance. Finally, we improve on previous attempts to integrate virtual outreach and communication to students in their college courses by incorporating AI response technologies to ensure students receive immediate responses to their questions, instead of having to wait for a university administrator or course instructor to respond.

RESEARCH DESIGN

Institutional Context

Georgia State University (GSU) is a public, research university in Atlanta, GA that enrolls more than 52,000 undergraduate students and confers more than 10,000 degrees each year. GSU is a minority serving institution and serves a comparatively lower-income population – about 53 percent of GSU students receive Pell grants. GSU has a pooled college completion rate nearly identical to the national four-year institution average, with about 56 percent of students earning a bachelor's degree within eight years of initial enrollment (College Scorecard, n.d.).

Intervention Course Context

Both the "Introduction to American Government" and "Principles of Microeconomics" courses were offered as online, asynchronous courses taught by full-time GSU faculty. The two courses varied in their content but also in their structure. Students in "Introduction to American Government" read a digital textbook embedded in an adaptive learning platform that quizzes them frequently as they progress through chapters. Students' course grades reflect performance on those adaptive quiz questions, completion of a visit to a local museum (or alternative assignment), and completion of and performance

[6] We refer to the individual monitoring the chatbot and responding to student questions as the "teaching assistant" for ease of interpretation. In practice, that individual was a graduate research assistant who had previously served as the TA for the course. We expect this role would be filled by a traditional teaching assistant in other courses employing an academic chatbot.

on 3-4 multiple choice exams. Students took these timed exams asynchronously within a one-week window and needed to either register for a time to take the exam at the campus testing center or use remote proctoring services to take the exam on their machine prior to the exam deadline.

In "Principles of Microeconomics," students' final grades reflected their participation (in the form of discussion boards), completion of practice assignments, and their completion of evaluative quizzes. Students completed upward of 120 small-scale assignments throughout the term that contributed toward their final grade, with no summative exam. The course did not have a set textbook but directed students to open access resources, and therefore did not record similar reading engagement metrics as the adaptive learning platform used in "Introduction to American Government."

Business as usual

The business-as-usual level of communications varied between the two focal courses. In "Introduction to American Government," standard communication from the instructor already incorporated regular, targeted, automated email reminders to students (similar to those tested experimentally in Carrell & Kurlaender, 2021). These messages included reminders about upcoming due dates, encouragement about recent performance, and suggestions for students to meet with the professor when they had failed to turn in an assignment or complete an exam. Some of these messages went to nearly all students (e.g., about 90 percent of students received a message congratulating them on completing the readings for chapter three) while some were targeted to a smaller group with specific course flags (e.g., about 4-5 percent of students received a note from the professor after they failed to submit exam 1 before the deadline). In "Principles of Microeconomics," instructors also leveraged the automatic email feature, sending reminders to students who had not logged onto the LMS in five days or reminders about upcoming assignments. Those professors also encouraged students to engage with them via virtual office hours as part of their status quo communications.

All students in the analytic sample (treatment and control) had opted in to receive regular text-based communication from GSU's university-wide retention chatbot. This program sends messages about upcoming administrative tasks (e.g., the opening of the FAFSA on October 1, when the next semester

courses are available for registration) and targeted messages about students' enrollment and accounts (e.g., notifying students who have a balance due or hold on their account for registration) in addition to relational messages to provide students with encouragement throughout the semester and to proactively ask them if they need support or if the bot can connect them with a GSU resource. Prior research found large effects of the retention chatbot on student completion of important college persistence tasks (Page, et al., 2020).

Intervention Description

All students enrolled in the focal courses at GSU received standard communications from the course instructor and teaching assistant, as described above. Treated students additionally received text messages from the course chatbot designed to (1) provide timely reminders of course requirements; (2) provide customized feedback on students' progress; (3) connect students to course-relevant academic supports; and (4) serve as an additional channel of communication between students and their course instructors. The chatbot messages fell into three broad categories: weekly updates, encouragement messages and reminder messages. Students received weekly updates every Monday to preview students' course tasks and responsibilities for that week. These updates were customized by whether students had completed the previous week's assignments. Encouragement messages were signed by the course TA and were crafted to promote a growth mindset and to invite students to provide feedback on how their semester was going. These encouragement messages were used more frequently in "Introduction to American Government." Finally, reminder messages were sent to students as needed (e.g., outreach to students who had not completed an online exam by a given time).

Via the Mainstay chatbot platform, the instructional team sent students 2-3 scheduled academic chatbot messages each week (about 40 total messages throughout the semester).[7] When students texted in with a question, the system's artificial intelligence (AI) responded with the closest match response in the system knowledge base. When the system flagged a response with a low probability of response match,

[7] See full messages from the fall 2021 implementation in "Introduction to American Government" in Appendix A

students' questions were answered directly by the teaching assistant upon their frequent review of flagged messages to provide personalized follow-up, as needed.[8] One additional novel feature of the "Introduction to American Government" course chatbot was a function called #quizme through which students could request a quiz on chapters covered in an upcoming exam. Through #quizme, students could receive and answer a set of multiple-choice questions, and for each one the bot would indicate whether they answered correctly and/or direct the student to where in the textbook they could read more about the topic and find the correct answer. The bot promoted #quizme in several weekly digests and additional promotional messages. Students could activate #quizme during the two weeks prior to each course exam due date.[9] Since the "Principles of Microeconomics" course did not have exams, GSU did not develop and deploy a #quizme tool for that course.

Intervention Development: Pilot Study

In spring 2021, we launched a pilot study of the course chatbot in the target "Introduction to American Government" section and distributed messages to all enrolled students who consented to text message communication from the university. [10] The pilot study enabled the course and research team to collaboratively develop messages aligned with the syllabus, receive qualitative feedback from students about the chatbot experience, and examine engagement patterns. Students enthusiastically recommended the bot – 90 percent of respondents recommended GSU continue the bot for this specific course and about 84 percent recommended expanding the bot to other courses. In addition to receiving student feedback on the bot, the spring pilot enabled us to develop a more robust bank of academic chatbot responses and better train the bot to the course context.[11] We also adapted messages based on student feedback and

[8] The course TA closely monitored the message interface the two hours following a scheduled campaign, given that most students that replied to the academic chatbot did so shortly after receiving a scheduled message. The TA also checked for flagged messages at least once (and often 2-3 times) each day.

[9] The course TA updated the bank of #quizme questions throughout the semester to reflect the chapters covered on the next exam.

[10] Of the 828 students enrolled in the course during spring 2021, 705 had previously opted in for texting from the university and received the pilot messages.

[11] For example, during the pilot the bot would often interpret a question about a course due date as a question about a GSU administrative due date (such as FAFSA or registration). The summer following the pilot, the course TA worked to substantially expand the knowledge base to ensure course-specific questions received a course-specific answer.

engagement data. Most notably, we transitioned to sending students weekly digests customized to their course performance to date (e.g., noting whether they had assignments missing or congratulating those who worked ahead) rather than a generic notice of upcoming due dates. We also developed a more consistent structure to the weekly digests. Finally, we worked to distinguish the tone and voice between the formal, structured weekly digests focused on sharing information and the warmer, less formal weekly encouragement messages intended to help students feel a sense of connection with the course and instructional team.[12]

Study Design

Each semester of the randomized controlled trial, we collaborated with GSU to identify all students who were enrolled in the focal courses who were also text-eligible by virtue of having consented to receive messages from GSU, and randomized students to either the academic chatbot treatment condition or to the control group. GSU provided the research team with an initial enrollment roster and a second group of students for randomization after the add/drop deadline. As a result of these enrollment patterns, students in the first round of randomization received an additional week of messaging relative to students in the second round of randomization. As described in more detail below, we account for randomization blocks in our analysis and do not drop students from analysis who dropped the course.[13]

Sample: Introduction to American Government

During the 2021-22 and fall 2022 academic terms we randomized students enrolled in "Introduction to American Government" taught by the partner faculty. In Table 1 we provide descriptive information about the intervention sample as well as balance on student characteristics between treatment and control students. Across three academic terms, the research team randomized 1,568 students enrolled in the course to treatment or control. In the pooled sample, a little over half of the sample were female, 43% were Black, 23% were white, 24% were first-generation college students, 58% were eligible for the

[12] Smaller edits included reducing the frequency of emojis in student messages and formalizing policies around message length.

[13] We code students who drop the course as having a zero for all outcomes other than when we examine the effect of treatment on dropping the course.

Pell grant, their average high school GPA was around a 3.5, and 9% had previously attempted the courses and were re-taking it. Overall, the share of freshmen was about 63%%, though the grade level composition of the course varied considerably across intervention terms, from 43% of the fall 2021 class to 78% of the fall 2022 class. We observed no significant differences in characteristics between students in the treatment and control conditions.

Sample: Principles of Microeconomics

During the fall and spring terms of the 2022-23 academic year we randomized 915 students enrolled in sections of "Principles of Microeconomics" taught by the partner faculty. In Table 2 we summarize student characteristics. Students were similar demographically to the "Introduction to American Government" (and the overall GSU) sample – about half of the course were female students, 51% were Black, 20% were white, 20% were first-generation students, 55% were eligible for the Pell grant, and their average high school GPA was about a 3.4. Unlike "Introduction to American Government," each intervention semester included a higher share of students re-taking the course – 14% in the fall 2022 term and 16% in the spring 2023 term. While overall a third of the analytic sample were freshmen, this varied even more across intervention terms than in the "Introduction to American Government" course. The "Principles of Microeconomics" course is much more likely to be taken by students who are not in their first semester of college – in fall 2022 only 13% of the sample were freshmen, while 50% of the spring semester were freshmen. The instructional team posits this is because the course has a math pre-requisite, which many students may complete their first semester.

ANALYTIC STRATEGY

Our primary analytic goal is to estimate the effect of being assigned to receive academic chatbot messaging on course performance, course engagement, and student sense of institutional support. To estimate these effects from the data, we use a regression model of the following general form:

$$Y_{irz} = \alpha_{irz} + \rho_r + \gamma_z + \beta T_i + X_i\gamma + \varepsilon_{irz}$$

Where Y_{irz} represents the outcome for study participant *i* randomized in round r and enrolled in term z, T_i is the indicator for assignment to treatment and is equal to one if the study participant *i* is randomized to the academic chatbot group and zero otherwise. X_i represents a vector of baseline characteristics for individual *i* (included primarily to explain residual variation in outcomes and to improve precision of estimation as a result) and ε_{ir} is a random error term. We also include fixed effects to account for the two rounds of randomization (ρ_r) and academic term (γ_z). We modify this model to include section fixed effects in the "Principles of Microeconomics" course reflecting the blocked randomization approach in that course across multiple instructors. We modify this analytic model to include an interaction between treatment and focal student characteristics for heterogeneous treatment analyses. We also present results from our main analytic model performed on subsamples to examine differences by student characteristics.[14]

We pre-registered the intervention and analysis with the Registry of Efficacy and Effectiveness Studies (REES) for each course under Registry ID 8160 and Registry ID 13760. We calculated a minimum detectable effect size (MDES) of about 0.157 standard errors given our initial sample size and randomization structure. We pre-specified various subgroup analyses to examine the extent to which the effect of treatment varies according to participant college level (e.g., freshmen vs. non-freshmen), gender, race, ethnicity, socioeconomic background (e.g., Pell status, first generation), and prior course exposure (e.g., first-time course takers vs. student re-taking the course).

Data and Measures

Most outcomes come from the deidentified course gradebook and GSU administrative records, provided directly to the research team for analysis. One unique feature of the "Introduction to American Government" course is the use of an entirely online textbook – no physical textbook was available, and students needed to access the readings through a course platform that incorporated reading prompts and

[14] We do not correct for multiple comparisons precisely because the outcomes in this analysis (e.g., completion of assignments and grade on assignments) are highly correlated but provide distinct perspectives on academic engagement. When comparing heterogeneous treatment effects, we do test for equality of coefficients across different subsamples.

benchmarks to guide reading. As a result, for that course we can observe the amount of time students spent reading specific sections, the percent of chapter sections read, and when (date and time) students read the textbook. This data enabled us to evaluate potential mechanisms through which the intervention might affect course performance and enabled the course teaching team to customize weekly outreach according to students' progress with reading to date.

Finally, we included a set of survey items to ask treatment participants about their experience with the course chatbot, including the extent to which they found the communication helpful, whether they read the text messages, whether they knew about and/or used the #quizme function (where applicable), and whether they would recommend future use of the chatbot in this and other GSU courses. As we detail below, two limitations to our survey analysis are low response rates and differential survey participation by student characteristics.

RESULTS

The rich data available on course performance and engagement enable us to examine not only whether students who received the intervention performed better in the course, but also if that performance boost was concentrated on certain course requirements (e.g., readings versus exams) and whether treatment affected the extensive (e.g., submission of an assignment) or intensive (e.g., performance on an assignment) margins of course engagement. In our presentation of results, we first share course performance, course engagement, and student attitudes results, followed by our exploratory analysis of treatment effects on "Supplemental Instruction" use[15] and overall semester performance and descriptive analysis of student feedback. Across tables, for each outcome, we share the main treatment effect estimates (presented with and without the vector of student covariates) followed by subgroup

[15] Supplemental Instruction (or "SI") is a formalized, course-specific academic support approach adopted at GSU and several other postsecondary institutions. At GSU, SI takes the form of weekly, optional, study sections for historically difficult courses led by graduate and undergraduate student leaders who have previously earned an A in the SI course.

effects from modifications to the main empirical model that incorporate interactions between treatment and student characteristics.

Main effects: Course Performance

We first examined the effect of the chatbot intervention on students' academic performance in the course. In Table 3, we report the treatment effects on students' attainment of performance benchmarks (earning an A, earning a B or higher, passing the course/earning a D or higher, or "DFW"ing) and on course completion (whether students withdrew or dropped the course) for "Introduction to American Government" and report on the same outcomes for "Principles of Microeconomics" in Table 4. Across both courses we find the largest overall treatment effect on whether students earned a B or higher in the course. The treatment effect on earning a B or higher was 5 percentage points relative to 61% of the control group in "Introduction to American Government" (about an 8% increase) and 6 percentage points relative to 62% of students in the control group in "Principles of Microeconomics" (nearly a 10% increase). In "Introduction to American Government" the number of students in the treatment group who earned an A in the course was 5 percentage points higher than those in the control group – the point estimate was also 5 percentage points for "Principles of Microeconomics," but was not statistically significant. In both courses, students assigned to treatment also saw statistically significant reductions in negative outcomes, though on slightly different margins. In "Principles of Microeconomics" students assigned to treatment were also 3 percentage points less likely to drop the course.

Looking by student characteristics, we first examined effects by socioeconomic background. We hypothesized that first-generation college students or lower-income students (as measured by Pell grant eligibility) might especially benefit from outreach, given lower access to the dominant social capital required to navigate most postsecondary institutions in the United States (Jack, 2016; Lareau, 2003; Walton & Cohen, 2007). In Tables 5 and 6, we show subgroup estimates of the treatment effect by parental education and family income for "Introduction to American Government" (Table 5) and "Principles of Microeconomics" (Table 6). We do not find that the treatment effects were statistically different from each other for first-generation students and non-first-generation students.

Looking by Pell status, we do not find statistically significant differences in most treatment effects, but note the magnitude of the treatment effects on the top end of the grading distribution (earning a B or higher or earning an A) are larger for comparatively higher income, non-Pell eligible students, and in "Introduction to Government" we found that course completion effects varied in sign by Pell status. Treated Pell eligible students were *more* likely to drop the course than Pell eligible control students, while treated non-Pell eligible students were *less* likely to drop the course than non-Pell eligible control students. In "Principles of Microeconomics" we find a very similar pattern, but on the margin of withdrawing for the course. These results highlight the need for better insights into how students, particularly those for whom scholarship eligibility is more pressing, manage their course enrollments and whether dropping or withdrawing from a course might be the optimal long-run choice.

We next examined effects by sex. As illustrated in Table 7, in "Introduction to American Government" we did not find that the effects for male and female students were statistically different from each other, though effects for male students were larger in magnitude – for example, treated male students were a statistically significant 7 percentage points more likely to earn a B or higher compared to a not statistically significant 2 percentage point difference in earning a B or higher for female students assigned to treatment compared to female students in the control group. However, in Table 8 we show the opposite trend for "Principles of Microeconomics" where female students assigned to treatment were substantially more likely to earn higher grades in the course and less likely to drop or DFW. We find treated female students were 8 percentage points more likely to earn an A, 12 percentage points more likely to earn a B or higher, 10 percentage points more likely to earn a C or higher, and 6 percentage points less likely to drop the course than female students in the control group, while we observe essentially no treatment effects for male students. Prior research has extensively documented lower economics persistence rates for female students, with these treatment effects suggesting a potential solution to increase female students' performance in gateway economics courses.

We next examined whether treatment affected student performance on specific course deliverables, leveraging detailed data from the "Introduction to American Government" course. In Table

9, we report on the overall treatment effect on students' final reading score, their online activities subscore[16], their activity subscore, and their score on each of the course exams.[17] We do not find statistically significant overall treatment effects on different deliverables. We find no evidence that the academic chatbot focused improved performance on one element of the course, but rather improved students' performance across all class components in a manner that added up to higher end-of-course grades.

Descriptive Analysis: Student Bot Experience

In Fall 2021, we fielded an in-depth survey with students in the "Introduction to American Government" course to gather insights into student perceptions of the academic chatbot. All students enrolled in the course that semester were invited to complete a standard end-of-course survey and were asked if they participated in the chatbot. Students who answered yes subsequently completed questions about the frequency, content, and tone of the chatbot as well as open-ended questions soliciting feedback and recommendations for academic chatbot extensions. Of the 128 treated students who completed the end-of-course survey, 110 (86 percent) indicated they recalled receiving the bot and were successfully transferred to the bot-specific survey items.[18] We report in Figure 1 treated student reports on their bot experience.

[16] In one activity (called "Know Thy Political Self"), students take an online political quiz to learn which political parties most closely reflect students' policy preferences. This is an entirely reflective activity and graded solely on completion (so long as they offer "thoughtful" written reflections). For the other activity (called "Voting in Georgia"), students watch tutorial videos on how to navigate and troubleshoot every aspect of the voting process. For this assignment, students' grades are based on how well they answer multiple questions that assess their comprehension and recall of the information provided in the videos.

[17] Students' final grades reflect their performance on chapter readings and online textbook question probes (28% of their final grade); exams (45% of their final grade, with each exam weighted to ensure the highest score counts the most and the lowest score counts the least); online activities (6% of their final grade); an in-person activity visiting the National Center for Civil and Human Rights, with an associated quiz and writing assignment (14% of their final grade, with substantial extra credit for early submission); and completing class surveys/a syllabus reading quiz (7% of their final grade). The course included four exams in the fall 2021 semester and three exams in the spring 2022 and fall 2022 semesters.

[18] We did observe 73 control group students incorrectly noting they received the bot messages and being routed to the bot-specific survey items; we hypothesize these students thought this question referred to whether they received messages from the main GSU retention bot and do not include their answers in our analysis. Students in the control group reporting receiving the academic chatbot messages may also be incorrectly assuming the question referred to instructor emails.

Overall, students reported high affinity for the bot experience. When asked "How helpful were messages from POLS1101 Pounce this semester", 71 percent of students reported the overall messaging campaign was at least "somewhat" useful, and 77 percent found the weekly assignment recap messages useful. Nearly 82 percent of students reported reading the messages, 92 percent of students recommend that the course use the bot for future students/sections, and 92 percent of students said they would recommend expanding the use of the course chatbot to other classes at GSU. These are similar to the positive survey responses to the spring pilot.

Interestingly, while about 79 percent of students reported knowing about the #quizme function, only 38 percent reported using the tool. We asked students who did not report using #quizme why they did not – about 20 students replied to this open-ended question with roughly half noting time constraints (e.g., "I kept forgetting to do it") and half reporting they did not think it would be useful (e.g., "my method for studying already worked well for me"). These insights provide valuable feedback on future marketing of #quizme – that the barriers to use are not knowledge of the tool but in students finding a way to fit #quizme into their schedules and highlighting the potential benefits of using #quizme.

Finally, we examined patterns of engagement in the student-bot message logs. We examined de-identified logs of all messages exchanged between students and the chatbot platform (inclusive of pre-scheduled messages, automated bot responses, and supplemental human responses) and report high-level engagement insights in Table 10. Here we can examine measures of treatment dosage, such as how many messages students receive and opt-out rates. We found that about 52 percent of students ever replied to a message, which could take the form of a question, using #quizme, or responding to a bot prompt asking about their experiences in the course so far. Very few of these replies appeared to be opt-outs – we only observed five percent (13 students) formally opting-out via text message.[19] The average total replies among treated students was 4.5 messages; conditional on every replying, students sent an average of eight messages throughout the semester. This varied from students who only sent one message (about a quarter

[19] We code opt-outs based on student replies including common opt-out language (e.g., "#pause" or "stop texting me").

of repliers only sent one message) to a handful of students who sent more than forty messages throughout the term. About a fifth of all students in the treatment group (and 40 percent of the students who ever replied) used the #quizme feature.[20] About 40 percent of students who used #quizme used it once, and another 20 percent used it twice (the #quizme function offered four unique quizzes throughout the semester corresponding with each of the four exams, though students could re-take the quizzes multiple times for each exam if they wished).

DISCUSSION

We evaluated the effect of an academic chatbot providing students with customized, timely, and regular notifications about course requirements and sharing encouragement on students' performance in large, online sections of undergraduate courses. Given the success of chatbots to improve students' completion of administrative college tasks, we hypothesized the course-specific integration of chatbot communication would improve course performance as well as completion of course tasks, such as completing the readings or turning exams in on time. Particularly given low national college completion rates and completion rates at our partner institution, we hoped the chatbot would support students' short-term course performance and have distal effects on persistence and future college engagement.

We find compelling evidence that the chatbot communication shifted students' final course grades, increasing the likelihood that students would earn a B or higher in the course. We also find suggestive evidence that the chatbot encourages course completion, as evidenced by a reduction in students dropping the "Principles of Microeconomics" course. Our heterogeneous treatment effect analyses also highlight for whom the bot may be most effective, often indicating larger treatment effects for students facing more substantial barriers to engagement. For example, there is a large literature

[20] We note that observed #quizme use (22 percent) calculated here is lower than self-reported #quizme use on the end-of-course survey (38 percent). The same demographic characteristics that predicted end-of-course survey completion also correlated with a higher likelihood of #quizme use (particularly that higher achieving students were more likely to engage in both activities), and thus the end-of-course survey includes a higher share of #quizme users than the overall treatment group.

highlighting the underrepresentation of women in the economics profession in general and the importance of diversifying undergraduate economics departments to attract a more representative student body (Bayer & Rouse, 2016; Yellen, 2019). If female students at GSU reflect these broader trends and face greater barriers to success in economics courses than male student, the strong treatment impacts of the academic chatbot for female students in the "Principles of Microeconomics" experiment suggests a promising strategy to increase representation in economics.

The AI chatbot technology enabled the instructional team to provide targeted, clear information to students about their course performance to date and the necessary tasks to complete to ensure success in the course. It is worth underscoring that the piloting and implementation of the technology required substantial upfront investment from the course instructional team and the university support office. Piloting the academic chatbot for a semester enabled the team to develop messages aligned with the course syllabus and provided time to train the bot on course-specific questions students might ask (as well as time to set up a course-specific #quizme question bank). In addition to targeting a course where students would likely benefit from the academic chatbot (e.g., a high enrollment course, a virtual course, a course with high "DFW" rates), the chatbot was easier to launch in a well-established course with a solidified course syllabus and schedule.

A successful implementation also requires ongoing human monitoring of messages to ensure students receive timely and accurate responses to any questions they have throughout the semester. For example, in one message, a student noted they had been dropped from the university (and course) for tuition non-payment. The chatbot replied immediately with the phone number of and a link to student financial services. In addition, the human teaching assistant for the course was able to follow-up with a note that the professor would be able to provide the student with access to the course textbook while they resolved their account hold so they would not fall behind on the reading. Successful implementation of a course chatbot requires sustained commitment and attention from the instructional team to ensure a high-quality student experience that is well aligned with the course itself. However, after the initial pilot period, weekly time spent monitoring and responding to messages took the course TA less than two hours

per week. The exchange regarding tuition non-payment also highlights the importance of providing students with multiple communication channels to reach their instructional team. Some students may feel uncomfortable discussing sensitive topics – such as being dropped for account nonpayment – in person with an instructor, but when prompted about a task may feel more comfortable sharing that information via text message and ultimately receiving a response that facilitates their completion of the course. In this sense, the academic chatbot may support students' sense of psychological safety by offering another channel through which to develop positive relationships and establish trust (Wanless, 2016).

We hypothesize that the marginal benefit of the academic chatbot may vary by course contexts, for example, being lower in courses where the chatbot would be the only means of personalized / proactive outreach from the instructional team, and higher in courses where the status quo communications from the instructional team are light in frequency and personalization. We also note that while many of the key components of the intervention – breaking down large assignments into manageable tasks, providing customized information about student performance to date, and opening a line of communication between the students and instructional team – translate across college subjects and courses, some features such as #quizme or specific questions about course content may be more difficult to scale. Future work will explore the implementation and effectiveness of the academic chatbot across other subjects as well as the effect of chatbots in different course structures (e.g., in-person or smaller courses).

REFERENCES

Belley, P., & Lochner, L. (2007). The changing role of family income and ability in determining educational attainment. *Journal of Human Capital, 1*(1)

Bettinger, E., & Baker, R. (2014). The effects of student coaching: An evaluation of a randomized experiment in student advising. *Educational Evaluation and Policy Analysis, 36*(1), 3-19.

Bettinger, E., Doss, C., Loeb, S., Rogers, A., & Taylor, E. (2017). The effects of class size in online college courses: Experimental evidence. *Economics of Education Review, 5*8, 68-85.

Bettinger, E. P., Fox, L., Loeb, S., & Taylor, E. S. (2017). Virtual Classrooms: How Online College Courses Affect Student Success. *American Economic Review*, 107 (9): 2855-75.

Boucher, K., Murphy, M., Bartell, D., Smail, J., Logel, C., & Danek, J. (2021) Centering the Student Experience: What Faculty and Institutions Can Do to Advance Equity, *Change: The Magazine of Higher Learning, 53*:6, 42-50, DOI: 10.1080/00091383.2021.1987804

Carrell, S. E. & Kurlaender, M. (2020). My professor cares: Experimental evidence on the role of faculty engagement (No. w27312). National Bureau of Economic Research.

Castleman, B. L., & Long, B. T. (2016). Looking beyond enrollment: The causal effect of need-based grants on college access, persistence, and graduation. *Journal of Labor Economics, 34*(4).

Castleman, B. L., & Page, L. C. (2015). Summer nudging: Can personalized text messages and peer mentor outreach increase college going among low-income high school graduates? *Journal of Economic Behavior & Organization*, *115*, 144-160.

Castleman, B. L., & Page, L. C. (2016). Freshman year financial aid nudges: An experiment to increase FAFSA renewal and college persistence. *Journal of Human Resources*, *51*(2), 389-415.

Castleman, B. L., & Page, L. C. (2017). Parental influences on postsecondary decision making: Evidence from a text messaging experiment. *Educational Evaluation and Policy Analysis*, *39*(2), 361-377.

Castleman, B. L., Page, L. C., & Schooley, K. (2014). The forgotten summer: Does the offer of college counseling after high school mitigate summer melt among college-intending, low-income high school graduates? *Journal of Policy Analysis and Management*, *33*(2), 320-344.

College Scorecard (n.d.). Georgia State University Profile. Retrieved from https://collegescorecard.ed.gov/.

Clotfelter, C. T., Hemelt, S. W., & Ladd, H. F. (2018). Multifaceted aid for low-income students and college outcomes: Evidence from North Carolina. *Economic Inquiry*, *56*(1), 278-303.

De Giorgi, G., Pellizzari, M, & Woolston, W. G. (2009). Class size and class heterogeneity. IZA Discussion Papers 4443, Institute of Labor Economics (IZA).

Giani, M. S., & Martin, A. (2021). Mobilizing developmental education: The causal effect of mobile app courseware on the college outcomes of developmental education students. *Educational Evaluation and Policy Analysis, 43*(4), 668-687.

Holzer, H., & Baum, S., (2017). *Making College Work: Pathways to Success for Disadvantaged Students*. Washington, DC: Brookings Institution Press.

Jack, A. (2016). *The Privileged Poor: How Elite Colleges are Failing Disadvantaged Students*. Cambridge, MA: Harvard University Press.

Kena, G., Aud, S., Johnson, F., Wang, X., Zhang, J., Rathbun, A., ... & Kristapovich, P. (2014). The Condition of Education 2014. NCES 2014-083. *National Center for Education Statistics*.

Kofoed, M., Gebhart, L., Gilmore, D., & Moschitto, R. (2021). Zooming to class?: Experimental evidence on college students' online learning during COVID-19. IZA Discussion Papers 14356, Institute of Labor Economics (IZA).

Lareau, A. (2003). *Unequal childhoods: Race, class, and family life.* (Second, Ed.) Oakland, CA: University of California Press.

Long, B. T., & Mabel, Z. (2012). Barriers to college success: Income disparities in progress to completion. Unpublished manuscript. Harvard University.

Ma, J., Pender, M, & Welch, M. (2019). Education Pays: 2019. Retrieved from: https://research.collegeboard.org/media/pdf/education-pays-2019-full-report.pdf

Marsicano, C., Felten, K., Toledo, L., & Buitendorp, M. (2020). Tracking campus responses to the COVID-19 pandemic. *APSA Preprints*. doi: 10.33774/apsa-2020-3wvrl. This content is a preprint and has not been peer-reviewed.

Mendes, W. B., Gray, H. M., Mendoza-Denton, R., Major, B., & Epel, E. S. (2007). Why egalitarianism might be good for your health: physiological thriving during stressful intergroup encounters. *Psychological science*, *18*(11), 991–998. https://doi.org/10.1111/j.1467-9280.2007.02014.

NCES (2019). U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) Fall Enrollment component, Spring 2013 through Spring 2019.

Oreopoulos, P., & Petronijevic, U. (2019). *The remarkable unresponsiveness of college students to nudging and what we can learn from it* (No. w26059). National Bureau of Economic Research.

Page, L. C., Castleman, B. L., & Meyer, K. (2020). Customized nudging to improve FAFSA completion and income verification. *Educational Evaluation and Policy Analysis*, *42*(1), 3-21.

Page, L. C., & Gehlbach, H. (2017). How an artificially intelligent virtual assistant helps students navigate the road to college. *AERA Open*, *3*(4).

Page, L. C., Kehoe, S. S., Castleman, B. L., & Sahadewo, G. A. (2019). More than dollars for scholars: The impact of the Dell Scholars Program on college access, persistence and degree attainment. *Journal of Human Resources, 54*(3), 683-725.

Page, L. C., Meyer, K., Lee, J., & Gehlbach, H. (2023). Conditions under which college students can be responsive to nudging. EdWorkingPapers Working Paper No. 20-242. Retrieved from Annenberg Institute at Brown University: https://doi.org/10.26300/vjfs-kv29

Paunesku, D., & Farrington, C. A. (2020). Measure learning environments, not just students, to support learning and development. *Teachers College Record*, *122*(14), 1-26.

Pugatch, T., & Wilson. N. (forthcoming). Nudging demand for academic support services: Experimental and structural evidence from higher education. *Journal of Human Resources*.

Scrivener, S., Weiss, M. J., Ratledge, A., Rudd, T., Sommo, C., Fresques, H. (2015). Doubling graduation rates: Three-year effects of CUNY's Accelerated Study in Associate Programs (ASAP) for developmental education students. MDRC evaluation report. Retrieved from: https://www.mdrc.org/sites/default/files/doubling_graduation_rates_fr.pdf

Simon, H. A. (1982). *Models of bounded rationality.* Cambridge, MA: MIT Press

Smith, E. N. (2020). Expansive care theory: Can messages of inspiring expectations and broad regard promote students' identity safety and academic success? [Doctoral dissertation, Stanford University] Available from ProQuest Dissertations & Theses Global.

Smith, B. O., White, D. R., Kuzyk, P. C., & Tierney, J. E. (2018) Improved grade outcomes with an e-mailed "grade nudge", *The Journal of Economic Education, 49*:1, 1-7, DOI: 10.1080/00220485.2017.1397570

Snyder, T., & Dillow, S. (2015). Digest of Education Statistics 2013. Retrieved from https://nces.ed.gov/pubs2015/2015011.pdf.

Thaler, R. H., & Sunstein, C. R. (2009). *Nudge: Improving decisions about health, wealth, and happiness.* London: Penguin Books.

Walton, G., & Cohen, G. (2007). A question of belonging: Race, social fit, and achievement. *Journal of Personality and Social Psychology, 92*(1), 82-96.

Wanless, S. B. (2016). The role of psychological safety in human development. *Research in Human Development*, *13*(1), 6-14.

Weiss, M. J., Ratledge, A., Sommo, C., & Gupta, H. (2019). supporting community college students from start to degree completion: Long-term evidence from a randomized trial of CUNY's ASAP. *American Economic Journal: Applied Economics*, *11*(3), 253-97.

TABLES AND FIGURES

Table 1: Analytic Sample and Randomization Balance
Introduction to American Government

	Fall 2021		Spring 2022		Fall 2022		Pooled	
	Control	Treatment	Control	Treatment	Control	Treatment	Control	Treatment
Female	0.62	0.01	0.60	0.06	0.47	0.02	0.56	0.03
		(0.043)		(0.044)		(0.042)		(0.025)
Asian	0.19	-0.01	0.27	-0.01	0.24	0.01	0.23	0.00
		(0.034)		(0.040)		(0.036)		(0.021)
Black	0.46	0.06	0.43	0.04	0.40	0.03	0.43	0.04
		(0.044)		(0.045)		(0.041)		(0.025)
White	0.27	-0.05	0.20	-0.01	0.23	-0.02	0.23	-0.03
		(0.038)		(0.036)		(0.035)		(0.021)
Hispanic	0.15	-0.01	0.15	0.01	0.15	-0.03	0.15	-0.01
		(0.031)		(0.033)		(0.029)		(0.018)
First Generation	0.24	0.01	0.24	0.04	0.23	0.02	0.24	0.02
		(0.039)		(0.040)		(0.035)		(0.022)
Pell Eligible	0.63	-0.04	0.59	0.01	0.53	-0.02	0.58	-0.02
		(0.043)		(0.045)		(0.042)		(0.025)
Course Re-takers	0.07	0.01	0.13	0.02	0.08	0.02	0.09	0.01
		(0.023)		(0.031)		(0.028)		(0.016)
Freshman	0.43	0.05	0.65	0.00	0.78	-0.01	0.63	0.01
		(0.043)		(0.043)		(0.028)		(0.022)
Upperclassman	0.49	-0.04	0.27	-0.01	0.17	0.00	0.30	-0.01
		(0.043)		(0.040)		(0.027)		(0.021)
Transfer	0.07	0.00	0.08	0.01	0.05	0.01	0.07	0.00
		(0.023)		(0.025)		(0.018)		(0.013)
High School GPA	3.45	0.02	3.46	0.05	3.61	-0.02	3.52	0.01
		(0.035)		(0.036)		(0.032)		(0.020)
N students		509		481		578		1568

Notes: Robust standard errors in parentheses. Includes randomization blocks. High school GPA and college GPA means reported here are conditional on having non-missing values. +p<0.10, *p<0.05, **p<0.01, ***p<0.001

Table 2: Analytic Sample and Randomization Balance
Introduction to Microeconomics

	Fall 2022		Spring 2023		Pooled	
	Control	Treatment	Control	Treatment	Control	Treatment
Female	0.54	-0.02	0.47	0.02	0.51	0.00
		(0.048)		(0.045)		(0.033)
Asian	0.20	-0.01	0.19	0.02	0.20	0.01
		(0.038)		(0.036)		(0.026)
Black	0.49	0.04	0.54	-0.02	0.51	0.01
		(0.048)		(0.045)		(0.033)
White	0.19	-0.03	0.20	-0.02	0.20	-0.02
		(0.037)		(0.035)		(0.025)
Hispanic	0.13	0.01	0.11	0.00	0.12	0.00
		(0.033)		(0.028)		(0.021)
First Generation	0.20	0.03	0.21	0.00	0.20	0.01
		(0.040)		(0.037)		(0.027)
Pell Eligible	0.57	-0.02	0.54	0.05	0.55	0.02
		(0.048)		(0.045)		(0.033)
Course Re-takers	0.14	-0.01	0.16	0.02	0.15	0.01
		(0.034)		(0.034)		(0.024)
Freshman	0.13	-0.03	0.50	-0.06	0.33	-0.04
		(0.031)		(0.045)		(0.028)
Upperclassman	0.70	0.00	0.42	0.05	0.55	0.03
		(0.044)		(0.045)		(0.032)
Transfer	0.16	0.03	0.07	0.01	0.12	0.02
		(0.037)		(0.024)		(0.021)
High School GPA	3.40	0.03	3.36	0.06	3.37	0.05
		(0.053)		(0.042)		(0.033)
Joint F-Test		0.99		0.78		0.74
N students		426		489		915

Notes: Robust standard errors in parentheses. Includes randomization blocks. High school GPA means reported here exclude students with missing GPAs. +p<0.10, *p<0.05, **p<0.01, ***p<0.001

Table 3: Main treatment effects of academic chatbot on final grades
Introduction to American Government

	AY 2021-22, Fall 2022			
	Control Mean	Treatment Effect	Treatment Effect	
Earned A	0.31	0.04	0.05	*
		(0.024)	(0.021)	
Earned B or higher	0.61	0.04	0.05	*
		(0.024)	(0.022)	
Earned C or higher	0.75	0.01	0.02	
		(0.022)	(0.020)	
DFW	0.25	-0.01	-0.02	
		(0.022)	(0.020)	
Withdrew	0.03	0.00	0.00	
		(0.008)	(0.008)	
Dropped Course	0.07	0.01	0.01	
		(0.013)	(0.013)	
Covariates included			X	
N students		1,568	1,568	

Notes: Robust standard errors in parentheses, includes randomization round and term fixed effects. Covariates include student demographics reported in balance table (*inter alia*, sex, race, socioeconomic status, prior course exposure, year in college, high school GPA).
+p<0.10, *p<0.05, **p<0.01, ***p<0.001

Table 4: Main treatment effects of academic chatbot on final grades
Introduction to Microeconomics

	AY 2022-23			
	Control Mean	Treatment Effect	Treatment Effect	
Earned A	0.44	0.03	0.05	
		(0.032)	(0.030)	
Earned B or higher	0.62	0.05	0.06	*
		(0.031)	(0.030)	
Earned C or higher	0.71	0.04	0.05	
		(0.029)	(0.028)	
DFW	0.29	-0.04	-0.05	
		(0.029)	(0.028)	
Withdrew	0.07	0.00	-0.01	
		(0.016)	(0.016)	
Dropped Course	0.08	-0.03	-0.03	+
		(0.016)	(0.016)	
Covariates included			X	
N students		915	915	

Notes: Robust standard errors in parentheses, includes randomization round and term fixed effects. Covariates include student demographics reported in balance table (*inter alia*, sex, race, socioeconomic status, prior course exposure, year in college, high school GPA).
+p<0.10, *p<0.05, **p<0.01, ***p<0.001

Table 5: Heterogeneous Treatment Effects by Socioeconomic Status
Introduction to American Government

	By Parental Education					By Pell Eligibility				
	First Generation		Continuing Generation			Pell eligible		Non-Pell eligible		
	Control Average	Treatment Effect	Control Average	Treatment Effect	Test of Equality	Control Average	Treatment Effect	Control Average	Treatment Effect	Test of Equality
Earned A	0.25	0.05	0.32	0.03		0.30	0.03	0.32	0.06 +	
		(0.043)		(0.025)			(0.027)		(0.034)	
Earned B or higher	0.54	0.04	0.63	0.04		0.59	0.02	0.63	0.08 **	
		(0.046)		(0.025)			(0.029)		(0.034)	
Earned C or higher	0.69	0.05	0.77	0.01		0.75	0.00	0.75	0.04	
		(0.043)		(0.023)			(0.026)		(0.031)	
DFW	0.31	-0.05	0.23	0.00		0.25	0.00	0.25	-0.04	
		(0.043)		(0.023)			(0.026)		(0.031)	
Withdrew	0.05	-0.02	0.02	0.00		0.03	0.01	0.03	-0.01	
		(0.020)		(0.009)			(0.012)		(0.012)	
Dropped Course	0.06	0.01	0.07	0.01		0.06	0.04 *	0.09	-0.03 +	**
		(0.026)		(0.015)			(0.017)		(0.020)	
Covariates Included		X		X			X		X	
N students		390		1178			898		670	

Notes: Robust standard errors in parentheses, includes randomization round and term fixed effects. Covariates include student demographics reported in balance table (*inter alia*, sex, race, socioeconomic status, prior course exposure, year in college, high school GPA). Test of equality evaluates equality of the treatment effect coefficient from separate regressions.
+p<0.10, *p<0.05, **p<0.01, ***p<0.001

Table 6: Heterogeneous Treatment Effects by Socioeconomic Status
Introduction to Microeconomics

	By Parental Education					By Pell Eligibility				
	First Generation		Continuing Generation			Pell eligible		Non-Pell eligible		
	Control Average	Treatment Effect	Control Average	Treatment Effect	Test of Equality	Control Average	Treatment Effect	Control Average	Treatment Effect	Test of Equality
Earned A	0.43	0.08	0.45	0.05		0.42	0.05	0.47	0.03	
		(0.066)		(0.035)			(0.040)		(0.048)	
Earned B or higher	0.57	0.13 +	0.63	0.05		0.62	0.05	0.62	0.08 +	
		(0.068)		(0.034)			(0.040)		(0.046)	
Earned C or higher	0.68	0.06	0.71	0.05		0.71	0.03	0.70	0.06	
		(0.068)		(0.032)			(0.037)		(0.044)	
DFW	0.32	-0.06	0.29	-0.05		0.29	-0.03	0.30	-0.06	
		(0.068)		(0.032)			(0.037)		(0.044)	
Withdrew	0.05	0.01	0.07	-0.01		0.06	0.02	0.07	-0.03	+
		(0.037)		(0.018)			(0.022)		(0.024)	
Dropped Course	0.09	-0.04	0.08	-0.03 +		0.06	-0.03 +	0.09	-0.04	
		(0.042)		(0.018)			(0.019)		(0.029)	
Covariates Included				X					X	
N students		191		724			515		400	

Notes: Robust standard errors in parentheses, includes randomization round and term fixed effects. Covariates include student demographics reported in balance table (*inter alia*, sex, race, socioeconomic status, prior course exposure, year in college, high school GPA). Test of equality evaluates equality of the treatment effect coefficient from separate regressions.
+p<0.10, *p<0.05, **p<0.01, ***p<0.001

Table 7: Heterogeneous Treatment Effects by gender, Introduction to American Government

	Female			Male			
	Control Average	Treatment Effect		Control Average	Treatment Effect		Test of Equality
Earned A	0.32	0.01		0.29	0.07	*	
		(0.028)			(0.033)		
Earned B or higher	0.61	0.02		0.60	0.07	*	
		(0.029)			(0.033)		
Earned C or higher	0.76	0.01		0.74	0.04		
		(0.027)			(0.031)		
DFW	0.24	-0.01		0.26	-0.04		
		(0.027)			(0.031)		
Withdrew	0.03	0.00		0.03	-0.01		
		(0.011)			(0.013)		
Dropped Course	0.07	0.01		0.06	0.00		
		(0.018)			(0.020)		
N students		899			669		
Covariates		X			X		

Notes: Robust standard errors in parentheses, includes randomization round and term fixed effects. Covariates include student demographics reported in balance table (*inter alia*, sex, race, socioeconomic status, prior course exposure, year in college, high school GPA). Test of equality evaluates equality of the treatment effect coefficient from separate regressions.
+p<0.10, *p<0.05, **p<0.01, ***p<0.001

Table 8: Heterogeneous Treatment Effects by gender, Introduction to Microeconomics

	Female			Male			
	Control Average	Treatment Effect		Control Average	Treatment Effect		Test of Equality
Earned A	0.43	0.08	+	0.46	0.01		
		(0.043)			(0.044)		
Earned B or higher	0.60	0.12	**	0.64	0.01		+
		(0.041)			(0.043)		
Earned C or higher	0.71	0.10	**	0.71	-0.01		*
		(0.039)			(0.041)		
DFW	0.29	-0.10	**	0.29	0.01		*
		(0.039)			(0.041)		
Withdrew	0.07	-0.01		0.07	0.00		
		(0.021)			(0.025)		
Dropped Course	0.09	-0.06	**	0.07	0.00		+
		(0.023)			(0.025)		
N students		463			452		
Covariates		X			X		

Notes: Robust standard errors in parentheses, includes randomization round and term fixed effects. Covariates include student demographics reported in balance table (*inter alia*, sex, race, socioeconomic status, prior course exposure, year in college, high school GPA). Test of equality evaluates equality of the treatment effect coefficient from separate regressions.
+p<0.10, *p<0.05, **p<0.01, ***p<0.001

Table 9: Treatment effect on course components, Introduction to American Government

	Control Mean	Treatment Effect	Treatment Effect
Reading Score	78.31	0.39	1.11
		(1.678)	(1.605)
Completed Exam 1	0.86	0.00	0.00
		(0.018)	(0.017)
Grade on Exam 1	65.75	-0.31	0.67
		(1.504)	(1.403)
Completed Exam 2	0.83	0.01	0.02
		(0.019)	(0.018)
Grade on Exam 2	60.22	1.30	2.25
		(1.524)	(1.424)
Completed Exam 3	0.82	0.00	0.01
		(0.019)	(0.019)
Grade on Exam 3	62.62	0.57	1.52
		(1.591)	(1.493)
Covariates			X
N students		1,568	1,568
Completed Exam 4	0.81	0.02	0.03
		(0.034)	(0.033)
Grade on Exam 4	58.14	1.30	2.53
		(2.617)	(2.438)
Covariates			X
N students		509	509
Completed NCCHR Activity	0.79	0.03	0.04
		(0.025)	(0.024)
Grade on NCCHR	83.20	3.08	3.52
		(2.775)	(2.626)
Covariates			X
N students		945	945

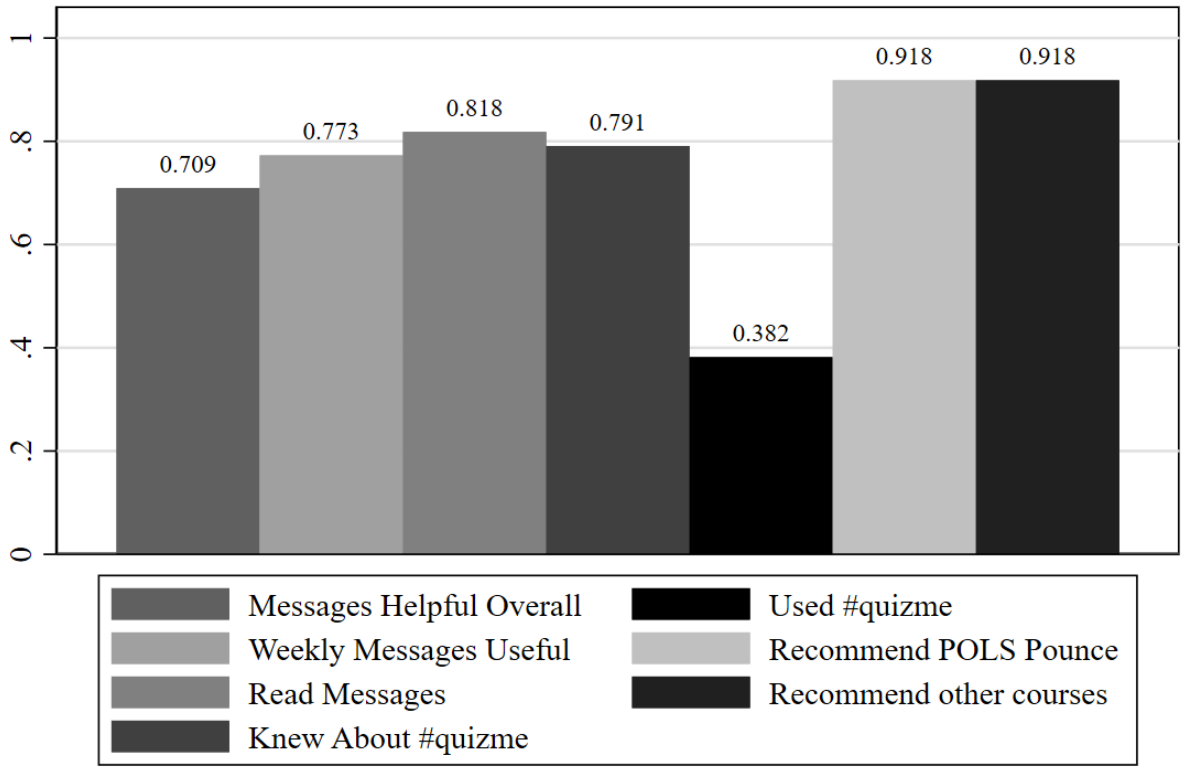
Notes: Robust standard errors in parentheses, includes randomization round and term fixed effects. Covariates include student demographics reported in Table 1 (*inter alia*, sex, race, socioeconomic status, prior course exposure, year in college, high school GPA). NCCHR was an in-person activity at the *National Center for Civil and Human Rights at GSU with an alternate assignment provided for students unable to complete it in person.*
+p<0.10, *p<0.05, **p<0.01, ***p<0.001

Table 10: Engagement Measures

(1) N Treated Students	(2) Average Messages Received	(3) Share Replying to Message	(4) Share Opt-Out	(5) Average Messages Sent	(6) Share using #quizme	(7) Average #quizme exchanges
255	51.9	0.52	0.05	4.53	0.22	0.60
	[25.7]	[0.50]	[0.22]	[9.26]	[0.41]	[1.54]

Notes: Standard deviations in parentheses. Reports raw engagement numbers. Fall 2021 metrics.

Figure 1
Fall 2021 Treated Student Bot Feedback



APPENDIX A – Chatbot Messages

LAUNCH MESSAGE_08.23.2021

Department / Office	Political Science 1101
Purpose	Launching TA Pounce to students in POLS 1101 (group 1)
Target Population	180
Successful Contacts	176

Script

Hi name_first! I'm the chatbot for American Government.
This term I'm working with Dr. Evans to help you stay on track. I'll send you course reminders and tips to succeed. You can text me questions anytime! So hit me up and I'll do my best to get you the answer.

Contacts without this profile information receive a backup text.

Pro-tip: Start each week with Dr. Evans' announcement.
👉 bit.ly/pols1101ann
If you don't want these messages, just text #PAUSE to stop (but I hope you'll give me a chance).

WEEK 1 GENERAL_08.24.2021

Department / Office	Political Science 1101
Purpose	Weekly reminder of upcoming due dates sent to all students
Target Population	178
Successful Contacts	174

Script

WEEKLY DIGEST

Hi - each week I'll send you a reminder of upcoming due dates. Last year, almost all students found these weekly digest messages helpful. They help you have all the info before you make a plan to complete your coursework.

Use this link to access Dr. Evans' announcement

bit.ly/F21pols1101ann

PRO-TIP: Download the Exam 1 study guide and fill out Ch. 1 this week as you read.

DUE THIS WEEK: You have 6 tasks (2hrs. total) due WK1 Due Date.

1 Watch COURSE INTRO VIDEO
2 Read Syllabus
3 Take Syllabus Quiz
4 Watch AREA9 INTRO VIDEO
5 Read Chapter 1
6 Take Pre-Course Survey

bit.ly/F21pols1101toc

LAUNCH MESSAGE RCT GROUP II_08.30.2021

Department / Office	Political Science 1101
Purpose	Launching TA Pounce to Group 2
Target Population	71
Successful Contacts	69

Script

Hi name_first ! I'm the chatbot for American Government.
This term I'm working with Dr. Evans to help you stay on track. I'll send you course reminders and tips to succeed. You can text me questions anytime! So hit me up and I'll do my best to get you the answer.

Contacts without this profile information receive a backup text.

Pro-tip: Start each week with Dr. Evans' announcement.
👉 bit.ly/pols1101ann
If you don't want these messages, just text #PAUSE to stop (but I hope you'll give me a chance).

WEEK 2 GENERAL_08.31.2021

Department / Office	Political Science 1101
Purpose	Weekly reminder of upcoming due dates sent to all students
Target Population	242
Successful Contacts	236

Script

WEEKLY DIGEST

Hi - this is your reminder of upcoming due dates. Start week 2 by reading Dr. Evans' announcement - it has essential info about extra credit and grades this week.

BITLY: Announcements

PRO TIP: To stay ahead, look ahead Exam 1 covers Chs. 1-3 & opens in 13 days.

DUE THIS WEEK: You have 1 task (75min. total) due WK2 Due Date.

1 Read Chapter 2

BITLY: TOC

WEEK 3 CUSTOMIZED DIGEST_ALL COMPLETE_09.07.2021

Department / Office	Political Science 1101
Purpose	Weekly reminder of upcoming due dates + personalized message to students who have completed all previously due graded requirements
Target Population	180
Successful Contacts	173

Script

WEEKLY DIGEST

Hi name_first ! I see you've completed all your reading so far this semester. Keep up the good work!
Reviewing the readings will help with Exam 1 next week. Supplemental Instruction (SI) can also help.

Contacts without this profile information receive a backup text.

Did you know that students who regularly attend SI score an average of one letter grade higher than students who don't? Come check it out!
BITLY: SI

PRO-TIP: Download & fill out the Exam 1 study guide. Schedule time in your calendar to fill out Chs. 1&2 if you haven't already.
DUE THIS WEEK: You have 2 tasks (about 2hrs total) due WK3 Due Date .
1 Read Chapter 3
2 Complete "Activity: Know Thy Political Self?"
BITLY: TOC

WEEK 3 CUSTOMIZED DIGEST_MISSING_09.07.2021

Department / Office	Political Science 1101
Purpose	Weekly reminder of upcoming due dates + personalized message to students who have at least missing graded requirement (<70%)
Target Population	24
Successful Contacts	23

Script

WEEKLY DIGEST

Hi name_first ! You seem to have a missing assignment. Check your iCollege email to see how to make it up. I'm here to help, so text me with any questions. Exam 1 is next week. Supplemental Instruction (SI) is a great way to prepare.

Contacts without this profile information receive a backup text.

Did you know that students who regularly attend SI score an average of one letter grade higher than students who don't? Can you find an hour this week to attend SI?

👉 BITLY: SI

PRO-TIP: Download & fill out the Exam 1 study guide. Schedule time in your calendar to fill out Chs. 1&2 if you haven't already.

DUE THIS WEEK: You have 2 tasks (about 2hrs total) due WK3 Due Date .

1 Read Chapter 3

2 Complete "Activity: Know Thy Political Self?"

👉 BITLY: TOC

WEEK 3 CUSTOMIZED DIGEST_MISSING GROUP II_09.07.2021

Department / Office	Political Science 1101
Purpose	Weekly reminder of upcoming due dates + personalized message to students who have at least missing graded requirement (<70%) This list includes students not included in data set from first missing message.
Target Population	38
Successful Contacts	37

Script

WEEKLY DIGEST

Hi name_first ! You seem to have a missing assignment. Check your iCollege email to see how to make it up. I'm here to help, so text me with any questions. Exam 1 is next week. Supplemental Instruction (SI) is a great way to prepare.

Contacts without this profile information receive a backup text.

Did you know that students who regularly attend SI score an average of one letter grade higher than students who don't? Can you find an hour this week to attend SI?

👉 BITLY: SI

PRO-TIP: Download & fill out the Exam 1 study guide. Schedule time in your calendar to fill out Chs. 1&2 if you haven't already.

DUE THIS WEEK: You have 2 tasks (about 2hrs total) due WK3 Due Date .

1 Read Chapter 3

2 Complete "Activity: Know Thy Political Self?"

👉 BITLY: TOC

WEEK 3 CUSTOMIZED DIGEST_WORK AHEAD_09.07.2021

Department / Office	Political Science 1101
Purpose	Weekly reminder of upcoming due dates + personalized message to students who have already completed all graded requirements due in course so far including the current week--students have worked ahead
Target Population	6
Successful Contacts	5

Script

WEEKLY DIGEST

Hi name_first ! I see you've already completed the assignments for this week. That's truly awesome—keep up the excellent work!
Exam 1 is next week. Supplemental Instruction (SI) is a great way to review the reading you've done.

Contacts without this profile information receive a backup text.

Did you know that students who regularly attend SI score an average of one letter grade higher than students who don't? Come check it out:
BITLY: SI

PRO-TIP: Download & fill out the Exam 1 study guide this week if you haven't already. This is also a great time to complete the NCCHR assignment early for extra credit.
Have a great week!

LAUNCH #QUIZME/INTRO TYLER_09.10.2021

Department / Office	Political Science 1101
Purpose	Encouraging message to all students introducing Tyler (but not COMMAND #tyler) and introducing COMMAND #quizme
Target Population	239
Successful Contacts	235

Script

Howdy name_first! This is Tyler—the human behind the chatbot for American Gov. Many students have told me it can be hard to know if they have studied enough for a test. So I've set up a feature for you in this chatbot called: #quizme

Contacts without this profile information receive a backup text.

Text back the command #quizme (include the hashtag) anytime to start a short quiz with questions covering concepts on Exam 1 coming up in 5 days. After you take the quiz, hit me up with any questions. Teamwork makes the dream work. Let's be a team!

EXAM 1 REMINDER TARGETED NUDGE_ZERO ENGAGEMENT_09.10.2021

Department / Office	Political Science 1101
Purpose	An Exam 1 reminder sent to students who have not accessed the course or any of its assignments at all.
Target Population	5
Successful Contacts	5

Script

Howdy name_first ! It's Tyler—the human behind the Am. Govt. chatbot. I noticed you haven't yet completed any graded assignments and wanted to check in. Dr. Evans also sent you a note to your iCollege email. It's not too late to get caught up in this class and I'm here to help. Text back with #tyler if you'd like to message me directly.

Contacts without this profile information receive a backup text.

The first exam in POLS1101 Exam 1 Date . Here's a checklist to prepare:
1 Read chapters 1-3
2 Fill out the Exam 1 study guide while you read
👉 BITLY: TOC

EXAM 1 REMINDER TARGETED NUDGE_ALL ENGAGED_09.10.2021

Department / Office	Political Science 1101
Purpose	An Exam 1 reminder sent to all students except those who have zero engagement with the course.
Target Population	241
Successful Contacts	230

Script

Hi name_first ! The first exam in POLS1101 Exam 1 Date . Here's a checklist to prepare:
1 Read/review chapters 1-3
2 Fill out the Exam 1 study guide while you read
👉 BITLY: TOC
Contacts without this profile information receive a backup text.

If you're not happy with your current grade, doing well on Exam 1 will really help. SI is a great way to prepare. Sign up for a session here:
👉 BITLY: SI
I'm always here to help. Text me any questions any time. Good luck!

WEEK 4 GENERAL DIGEST_EXAM 1_09.13.2021

Department / Office	Political Science 1101
Purpose	Week 4 messages to all students reminding them of upcoming due dates.
Target Population	237
Successful Contacts	234

Script

WEEKLY DIGEST

Hi name_first ! Roses are red, violets are blue.. its exam week, so check out SI at GSU! Supplemental Instruction leaders are both rhyming experts (like me, ha) and former students of POLS1101 here to support you.

BITLY: SI

Contacts without this profile information receive a backup text.

PRO-TIP: Try #quizme before the exam to make sure you're ready.

DUE THIS WEEK: Exam 1 Exam 1 Date . 60 questions in 75 minutes. Covers Chapters 1-3. Good luck and text me any questions!

BITLY: TOC

EXAM 1 CLOSES TARGETED NUDGE_09.17.2021

Department / Office	Political Science 1101
Purpose	A targeted nudge sent to students who have not yet attempted Exam 1 reminding them it is due at midnight tonight.
Target Population	138
Successful Contacts	131

Script

Hi name_first ! This is a friendly reminder that Exam 1 closes tonight @ 11:59pm.
Log into iCollege and click on the Exam 1 link.
Once you begin, you have 75 minutes to answer 60 questions about the content covered in Chs. 1-3.
I'm here to help. Text me any questions any time. Good luck!

Contacts without this profile information receive a backup text.

WEEK 5 CUSTOMIZED DIGEST_ ALL COMPLETE_ 09.20.2021

Department / Office	Political Science 1101
Purpose	Week 5 message to students who completed Exam 1 but have not worked ahead to complete this week's assignments.
Target Population	202
Successful Contacts	193

Script

WEEKLY DIGEST

Hi name_first ! You've finished the first exam—great job! I'm proud of all the work you put in so far.

The next exam covers Chs. 4-7: one long and challenging chapter per week. Be prepared to spend a bit more time mastering the material.

Contacts without this profile information receive a backup text.

PRO-TIP: If you complete the NCCHR assignment this week, it could add up to 3 points to your final course grade.

DUE THIS WEEK: You have 2 tasks (about 2hrs. total) due WK5 Due Date .

1 Read Chapter 4

2 Take Check-in Survey I

BITLY: TOC

WEEK 5 CUSTOMIZED DIGEST_ MISSING EXAM 1_ 09.20.2021

Department / Office	Political Science 1101
Purpose	Week 5 message to students who did not complete Exam 1.
Target Population	10
Successful Contacts	10

Script

WEEKLY DIGEST

Hi name_first ! I see you did not take Exam 1. Follow this link to take action on making up the exam. Do this today! Dr. Evans will only allow make-ups for a few days.

bit.ly/exam1makeup

Contacts without this profile information receive a backup text.

PRO-TIP: If you complete the NCCHR assignment this week, it could add up to 3 points to your final course grade.

DUE THIS WEEK: You have 2 tasks (about 2hrs. total) due WK5 Due Date .

1 Read Chapter 4

2 Take Check-in Survey I

BITLY: TOC

WEEK 5 CUSTOMIZED DIGEST_ WORK AHEAD_ 09.20.2021

Department / Office	Political Science 1101
Purpose	Week 5 message to students who completed Exam 1 and have worked ahead to complete this week's assignments.
Target Population	7
Successful Contacts	6

Script

WEEKLY DIGEST

Hi name_first ! You've finished the first exam—great job! I'm proud of all the work you put in so far.

The next exam covers Chs. 4-7: one long and challenging chapter per week. Be prepared to spend a bit more time mastering the material.

Contacts without this profile information receive a backup text.

PRO-TIP: If you complete the NCCHR assignment this week, it could add up to 3 points to your final course grade.

Don't forget to take the Check-in Survey I (about 15min.) if you haven't already. It's due Sunday @ 11:59pm.

BITLY: TOC

ENCOURAGEMENT WK5_09.23.2021

Department / Office	Political Science 1101
Purpose	Encouragement message sent to all students addressing how students may be feeling overwhelmed at this point in the semester.
Target Population	225
Successful Contacts	215

Script

Howdy name_first ! Tyler here—the human behind the chatbot for American Gov. Students have told me they feel overwhelmed at this point in the semester. Especially after the first exam, it's totally normal to feel this way.

Contacts without this profile information receive a backup text.

It's also totally normal for this feeling to pass, so I encourage you to continue working hard. I'm here for you, too. Text in your questions any time and if the bot can't answer them, I will. I wish you the best of luck this semester. I'm rooting for you big time!

WEEK 6 CUSTOMIZED DIGEST_ALL COMPLETE_09.27.2021

Department / Office	Political Science 1101
Purpose	Week 6 message to students who have completed all assignments due since Exam 1.
Target Population	160
Successful Contacts	154

Script

WEEKLY DIGEST

Hi name_first ! I see you completed the reading last week. Keep up the good work!

This week you'll be reading about federalism: a key concept to understanding where power is allocated in the different levels of American government.

Contacts without this profile information receive a backup text.

PRO-TIP: Tyler is a political scientist here to help. Text in #tyler to ask any questions directly to him.

DUE THIS WEEK: You have 1 task (about 2hrs. total) due WK6 Due Date .

1 Read Chapter 5

bit.ly/F21pols1101toc

WEEK 6 CUSTOMIZED DIGEST_MISSING_09.27.2021

Department / Office	Political Science 1101
Purpose	Week 6 message to students who have at least one missing assignment since Exam 1.
Target Population	58
Successful Contacts	23

Script

WEEKLY DIGEST 😈
Hi name_first ! You seem to have a missing assignment. Check your iCollege email to see how to make it up.
I'm here to help, so text me with any questions.
Exam 2 opens in 14 days – have you thought about scheduling a time to take the exam in the proctoring lab?

Contacts without this profile information receive a backup text.

If you are able, it can be helpful to take Exam 2 in the proctoring lab on campus. It helps alleviate distractions and gives you a deadline for studying – schedule your time soon:
👉 bit.ly/F21pols1101examlab

PRO-TIP: Download and fill out the Exam 2 study guide. Schedule time to fill out Chs. 4 & 5 if you haven't already.
DUE THIS WEEK: You have 1 task (about 1.5hrs. total) due @ 11:59pm 10/10.
1 Read Chapter 6
👉 bit.ly/F21pols1101toc

WEEK 6 CUSTOMIZED DIGEST_WORK AHEAD_09.27.2021

Department / Office	Political Science 1101
Purpose	Week 6 message to students who have already completed all assignments due this week.
Target Population	8
Successful Contacts	7

Script

WEEKLY DIGEST

Hi name_first ! I see you've already completed the assignments for this week. That's truly awesome—keep up the excellent work!

Make sure you fully understand federalism by scheduling an SI session this week.

Have a good one!

👉 bit.ly/F21pols1101toc

Contacts without this profile information receive a backup text.

WEEK 7 CUSTOMIZED DIGEST_ALL COMPLETE_10.04.2021

Department / Office	Political Science 1101
Purpose	Week 7 message to students who have completed all assignments since Exam 1.
Target Population	155
Successful Contacts	145

Script

WEEKLY DIGEST 🤖
Hi name_first ! I see you've completed the readings for Exam 2 so far. Keep up the good work!
Exam 2 opens in 14 days – have you thought about scheduling a time to take the exam in the proctoring lab?

Contacts without this profile information receive a backup text.

If you are able, it can be helpful to take Exam 2 in the proctoring lab on campus. It helps alleviate distractions and gives you a deadline for studying – schedule your time soon:
👉 bit.ly/F21pols1101examlab

PRO-TIP: Download and fill out the Exam 2 study guide. Schedule time to fill out Chs. 4 & 5 if you haven't already.
DUE THIS WEEK: You have 1 task (about 1.5hrs. total) due WK7 Due Date .
1 Read Chapter 6
👉 BITLY: TOC

WEEK 7 CUSTOMIZED DIGEST_MISSING_10.04.2021

Department / Office	Political Science 1101
Purpose	Week 7 message to students who have at least one missing assignment since Exam 1.
Target Population	155
Successful Contacts	145
Script	

WEEKLY DIGEST

Hi name_first! You seem to have a missing assignment. Check your iCollege email to see how to make it up.
I'm here to help, so text me with any questions.
Exam 2 opens in 14 days – have you thought about scheduling a time to take the exam in the proctoring lab?

Contacts without this profile information receive a backup text.

If you are able, it can be helpful to take Exam 2 in the proctoring lab on campus. It helps alleviate distractions and gives you a deadline for studying – schedule your time soon:
👉 bit.ly/F21pols1101examlab

PRO-TIP: Download and fill out the Exam 2 study guide. Schedule time to fill out Chs. 4 & 5 if you haven't already.
DUE THIS WEEK: You have 1 task (about 1.5hrs. total) due @ 11:59pm 10/10.
1 Read Chapter 6
👉 bit.ly/F21pols1101toc

WEEK 7 CUSTOMIZED DIGEST_WORK AHEAD_10.04.2021

Department / Office	Political Science 1101
Purpose	Week 7 message to students who have already completed all assignments due this week.
Target Population	155
Successful Contacts	145
Script	

WEEKLY DIGEST

Hi name_first! I see you've already completed the assignments for this week. That's truly awesome—keep up the excellent work!

PRO-TIP: Download and fill out the Exam 2 study guide. Schedule time to fill out Chs. 4 & 5 if you haven't already.

Contacts without this profile information receive a backup text.

Exam 2 opens in 14 days – have you thought about scheduling a time to take the exam in the proctoring lab?

If you are able, it can be helpful to take Exam 2 in the proctoring lab on campus. It helps alleviate distractions and gives you a deadline for studying – schedule your time soon:

👉 bit.ly/F21pols1101examlab

W DAY TARGETED NUDGE_10.05.2021

Department / Office	Political Science 1101
Purpose	Targeted nudge reminding students of the Withdrawal deadline sent to students who are currently failing the course.
Target Population	28
Successful Contacts	23

Script

name_first, if you haven't already, check your iCollege email for a note from Dr. Evans about the withdrawal deadline coming up in 1 week. If this course isn't going the way you intended, schedule an appointment with your advisor today to discuss your options.

👉 bit.ly/GSUadvising

Contacts without this profile information receive a backup text.

Dr. Evans wants to work with you to stay in the course and be successful in the long run. He would like to hear from you about any concerns you are having.

👉 POLS1101 Email

WEEK 8 CUSTOMIZED DIGEST_ALL COMPLETE_10.11.2021

Department / Office	Political Science 1101
Purpose	Week 8 message to students who have completed all assignments since Exam 1.
Target Population	144
Successful Contacts	129

Script

WEEKLY DIGEST

Hi name_first ! I see you've completed the readings for Exam 2 so far. Keep up the good work!

#quizme is open again. Text back #quizme for a short quiz to help prepare you for Exam 2 which Exam 2 Date .

Contacts without this profile information receive a backup text.

PRO-TIP: Schedule time in your calendar to complete the NCCHR tour before 10/31 for 10 points extra credit on the assignment.

DUE THIS WEEK: You have 1 task (about 1.5hrs. total) due @ 11:59pm 10/17.

1 Read Chapter 7

BITLY: TOC

WEEK 8 CUSTOMIZED DIGEST_MISSING_10.11.2021

Department / Office	Political Science 1101
Purpose	Week 8 message to students who have at least one missing assignment since Exam 1.
Target Population	73
Successful Contacts	62

Script

WEEKLY DIGEST

Hi name_first ! You seem to have a missing assignment. Check your iCollege email to see how to make it up.
I'm here to help, so text me with any questions.

Contacts without this profile information receive a backup text.

#quizme is open again. Text back #quizme for a short quiz to help prepare you for Exam 2 which Exam 2 Date .

PRO-TIP: Schedule time in your calendar to complete the NCCHR tour before 10/31 for 10 points extra credit on the assignment.
DUE THIS WEEK: You have 1 task (about 1.5hrs. total) due @ 11:59pm 10/17.
1 Read Chapter 7
BITLY: TOC

WEEK 8 CUSTOMIZED DIGEST_WORK AHEAD_10.11.2021

Department / Office	Political Science 1101
Purpose	Week 8 message to all students who have already completed the assignments due this week.
Target Population	10
Successful Contacts	7
Script	

WEEKLY DIGEST

Hi name_first ! I see you've already completed the assignments for this week. That's truly awesome—keep up the excellent work!

#quizme is open again. Text back #quizme for a short quiz to help prepare you for Exam 2 which Exam 2 Date .

Have a great week!

Contacts without this profile information receive a backup text.

ENCOURAGEMENT INTERACTIVE WK8_10.14.2021

Department / Office	Political Science 1101
Purpose	Encouraging message sent to all students asking them how their semester has been going so far.
Target Population	225
Successful Contacts	196
Response Rate	13.3%

Script

Howdy name_first ! Tyler here! I've heard from some students, and I know yall are juggling important priorities in your life. Dr. Evans understands and works hard to make POLS1101 manageable for you.

Contacts without this profile information receive a backup text.

I encourage you to keep this class in your priority list, and I would love to hear from you.
How is POLS1101 going for you so far? REPLY 1/2/3

[1]: Good! 😍
[2]: Meh ... 😐
[3]: Not so good. 😔

1 Good! 😍

That's great to hear! I knew you could do it. Would you mind sharing what makes POLS1101 a good class for you? REPLY1/2/3

[1]: Work at my own pace/schedule
[2]: Support from the professor
[3]: Easy to manage course material

1 Work at my own pace/schedule

Balancing courses along with everything else in life can be challenging. I'm so glad POLS1101 online model has worked well for you. Keep up the good work!

2 Support from the professor

Dr. Evans works hard to support you even though we're all fully online. I'm so glad to hear you feel supported and connected to the course. I'll be sure to let him know!

3 Easy to manage course material

Making the course manageable for busy students like you is a top priority for Dr. Evans. He'll be glad to know you like the way it's set up. Thanks for sharing!

2 Meh ... 😐

I'm sorry to hear that. Do you mind sharing what has been the most challenging part of POLS1101? REPLY 1/2/3

[1]: Managing course workload
[2]: Connecting with Dr. Evans
[3]: Understanding course content

1 Managing course workload

Taking courses online can be a lot of work without all the normal support. Dr. Evans and I are here to help. Email him or text me any time you need help with course material.

2 Connecting with Dr. Evans

Dr. Evans is always here to help. Use the course email below to connect with him. I will let him know to look out for an email from you. Thanks for your patience, and he looks forward to hearing from you.
👉 POLS1101 Email

3 Understanding course content

Taking courses online can be challenging without the normal support. Dr. Evans and I are here to help. Email him or text me any time you need help with course material.

3 Not so good. 😞

I'm sorry to hear that. Do you mind sharing what has been the most challenging part of POLS1101? REPLY 1/2/3

[1]: Managing course workload
[2]: Connecting with Dr. Evans
[3]: Understanding course content

1 Managing course workload

Taking courses online can be a lot of work without all the normal support. Dr. Evans and I are here to help. Email him or text me any time you need help with course material.

2 Connecting with Dr. Evans

Dr. Evans is always here to help. Use the course email below to connect with him. I will let him know to look out for an email from you. Thanks for your patience, and he looks forward to hearing from you.
👉 POLS1101 Email

3 Understanding course content

Taking courses online can be challenging without the normal support. Dr. Evans and I are here to help. Email him or text me any time you need help with course material.

WEEK 9 GENERAL DIGEST_10.18.2021

Department / Office	Political Science 1101
Purpose	Week 9 message to all students reminding them of upcoming due dates.
Target Population	225
Successful Contacts	210

Script

Hi name_first! It's exam week in POLS1101.
PRO-TIP: Try #quizme before the exam to make sure you're ready.
DUE THIS WEEK: Exam 2 opens 10/18 – closes @ 11:59pm 10/22. 60 questions in 75 minutes. Covers Chapters 4-7. Good luck and text me any questions!

Contacts without this profile information receive a backup text.

EXAM 2 CLOSES TARGETED NUDGE_10.22.2021

Department / Office	Political Science 1101
Purpose	Reminder message that Exam 2 closes tonight at midnight sent to those students who have not yet attempted the exam as of 1pm.
Target Population	165
Successful Contacts	157

Script

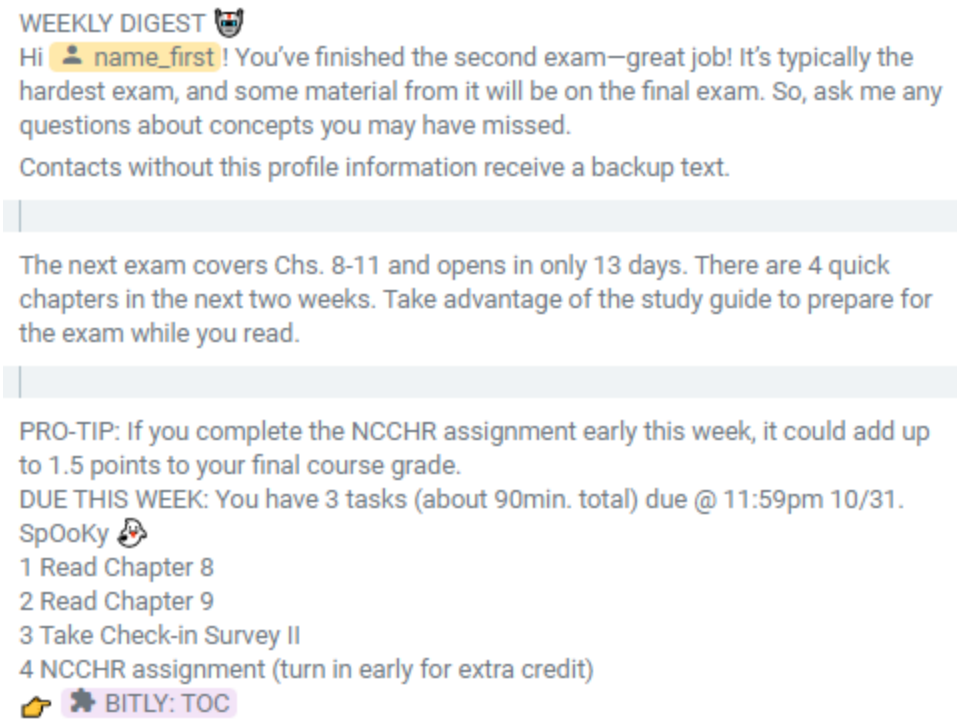
Hi name_first ! This is a friendly reminder that Exam 2 closes tonight @ 11:59pm.
Log into iCollege and click on the Exam 2 link.
Once you begin, you have 75 minutes to answer 60 questions about the content covered in Chs. 4-7.
I'm here to help. Text me any questions any time. Good luck!

Contacts without this profile information receive a backup text.

WEEK 10 CUSTOMIZED DIGEST_ALL COMPLETE_10.26.2021

Department / Office	Political Science 1101
Purpose	Week 10 message reminding students of upcoming due dates sent to students who completed Exam 2.
Target Population	202
Successful Contacts	186

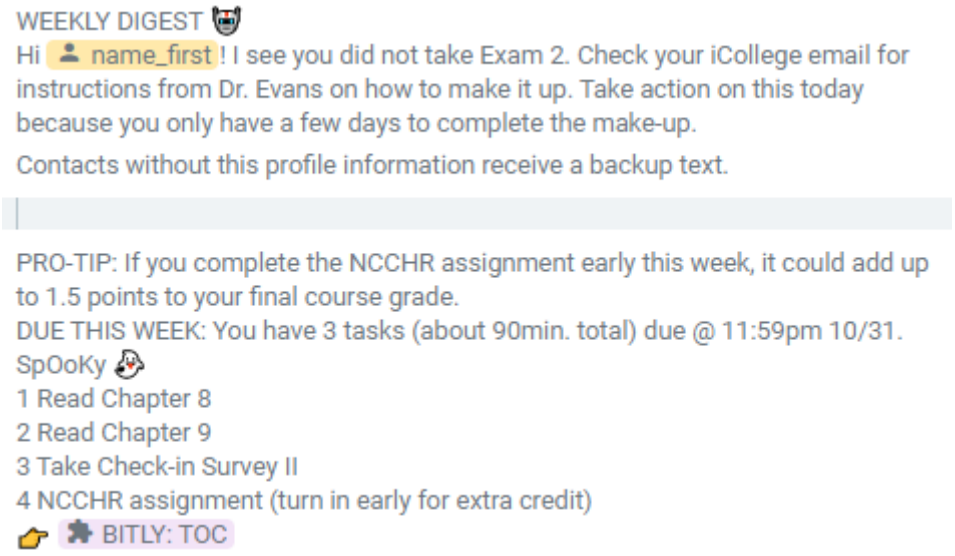
Script



WEEK 10 CUSTOMIZED DIGEST_MISSING_10.26.2021

Department / Office	Political Science 1101
Purpose	Week 10 message reminding students of upcoming due dates sent to students who did not attempt Exam 2.
Target Population	17
Successful Contacts	17

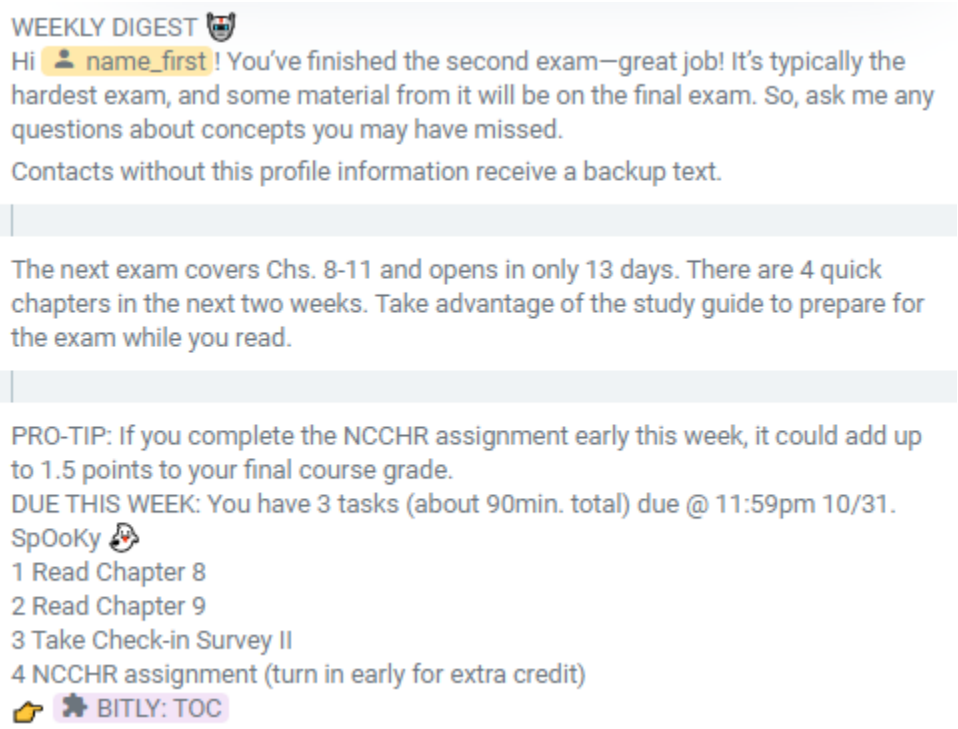
Script



WEEK 10 CUSTOMIZED DIGEST_WORK AHEAD_10.26.2021

Department / Office	Political Science 1101
Purpose	Week 10 message reminding students of upcoming due dates sent to students who completed Exam 2.
Target Population	202
Successful Contacts	186

Script



ENCOURAGEMENT INTERACTIVE WK10_10.28.2021

Department / Office	Political Science 1101
Purpose	Encouraging message sent to all student asking them to share how they felt about Exam 2.
Target Population	169
Successful Contacts	155
Response Rate	29%

Script

Howdy name_first ! Tyler here! Sooo.. how'd the exam go?! I know Exam 2 is typically the hardest one. How did you feel about it? REPLY 1/2/3
Contacts without this profile information receive a backup text.

[1]: Good! 😁
[2]: Meh... 😐
[3]: Not so good. 😒

1 Good! 😁

That's great to hear! So that we can better support our students, would you mind sharing what you found most helpful during studying or on the exam? I'm sure your peers would love to hear any advice you have to share. We won't include your name!

2 Meh... 😐

So that we can better support our students, would you mind sharing what went well and what didn't go so well during studying or on the exam? Is there anything Dr. Evans can do to help support you on exams?

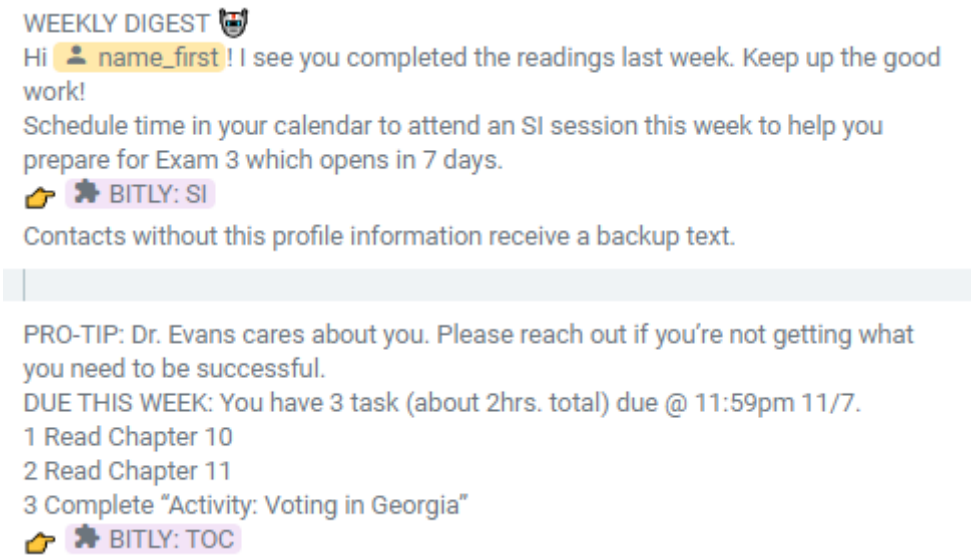
3 Not so good. 😒

So that we can better support our students, would you mind sharing what didn't go so well during studying or on the exam? Is there anything Dr. Evans can do to help support you on exams?

WEEK 11 CUSTOMIZED DIGEST_ALL COMPLETE_11.01.2021

Department / Office	Political Science 1101
Purpose	An encouragement message from Tyler letting students know that #quizme is now open for Exam 3.
Target Population	155
Successful Contacts	141

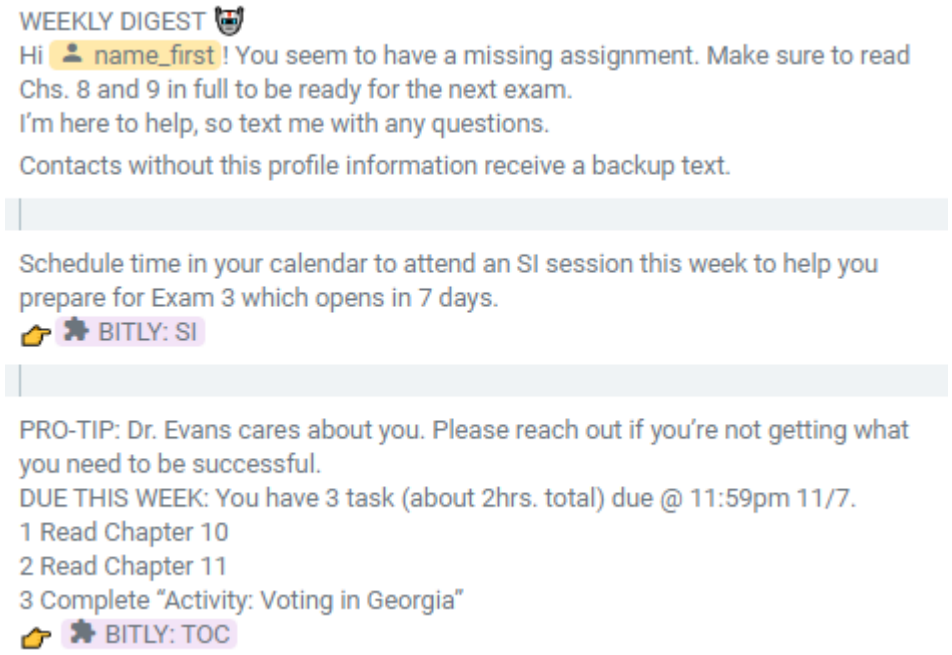
Script



WEEK 11 CUSTOMIZED DIGEST_MISSING_11.01.2021

Department / Office	Political Science 1101
Purpose	Week 11 message reminding students of upcoming due dates sent to student who have at least one missing reading since Exam 2.
Target Population	46
Successful Contacts	44

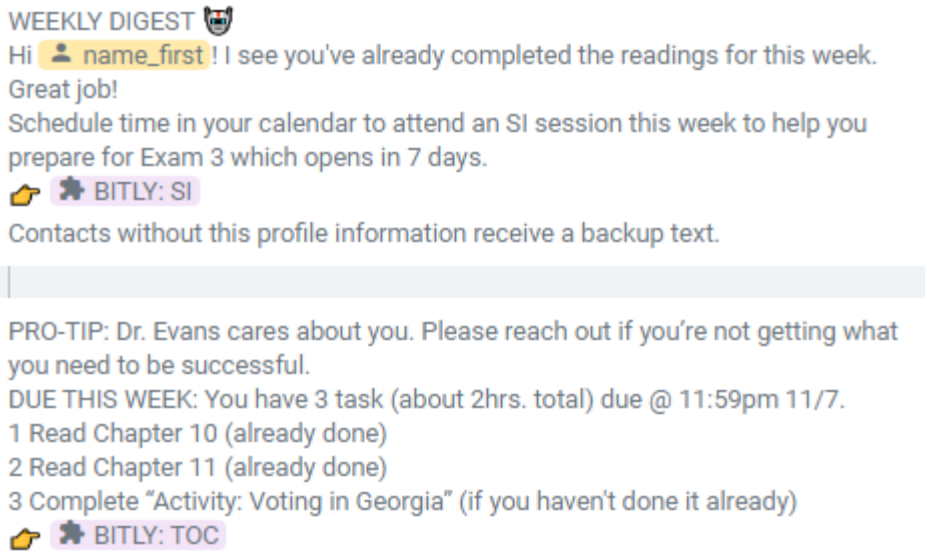
Script



WEEK 11 CUSTOMIZED DIGEST_WORK AHEAD_11.01.2021

Department / Office	Political Science 1101
Purpose	Week 11 message reminding students of upcoming due dates sent to students who have already completed this week's reading.
Target Population	5
Successful Contacts	5

Script



ENCOURAGEMENT WK11 EXAM 3 #QUIZME_11.04.2021

Department / Office	Political Science 1101
Purpose	An encouragement message from Tyler letting students know that #quizme is now open for Exam 3.
Target Population	225
Successful Contacts	209

Script

Howdy name_first ! Tyler here. I've got good news. I updated #quizme! So, text back the hashtag "#quizme" to get a short quiz designed to help you prepare for Exam 3.

Contacts without this profile information receive a backup text.

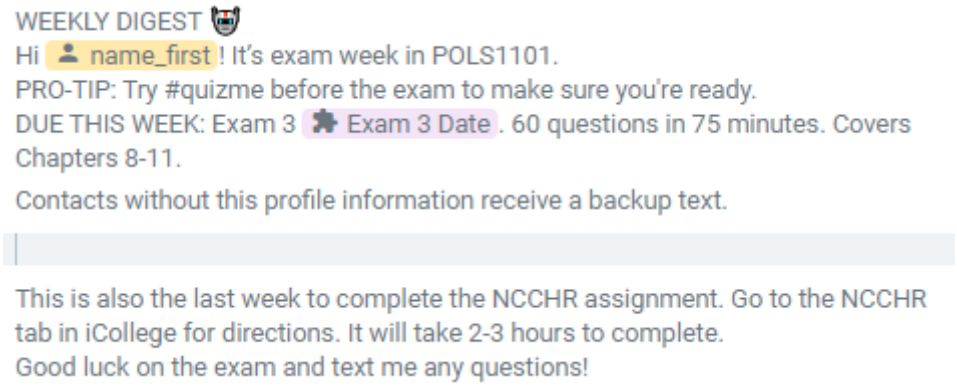
Students who used #quizme on the first two exams scored on average higher than students who didn't. Try it out before you take the exam. Another great resource is SI. Schedule a session using the link below.

BITLY: SI

WEEK 12 GENERAL DIGEST_NCCHR NOT COMPLETE_11.08.2021

Department / Office	Political Science 1101
Purpose	Week 12 message sent to students who have not completed NCCHR assignment reminding students that Exam 3 opens today and closes Friday.
Target Population	138
Successful Contacts	128

Script



WEEK 12 GENERAL DIGEST_NCCHR COMPLETE_11.08.2021

Department / Office	Political Science 1101
Purpose	Week 12 message sent to students who have completed NCCHR assignment reminding them that Exam 3 opens today and closes Friday.
Target Population	87
Successful Contacts	81
Script	

WEEKLY DIGEST
Hi name_first ! It's exam week in POLS1101.
PRO-TIP: Try #quizme before the exam to make sure you're ready.
DUE THIS WEEK: Exam 3 Exam 3 Date . 60 questions in 75 minutes. Covers Chapters 8-11. Text me any questions and good luck!
Contacts without this profile information receive a backup text.

EXAM 3 CLOSES TARGETED NUDGE_11.12.2021

Department / Office	Political Science 1101
Purpose	Message reminding students who have not taken Exam 3 that it closes tonight at midnight.
Target Population	162
Successful Contacts	156
Script	

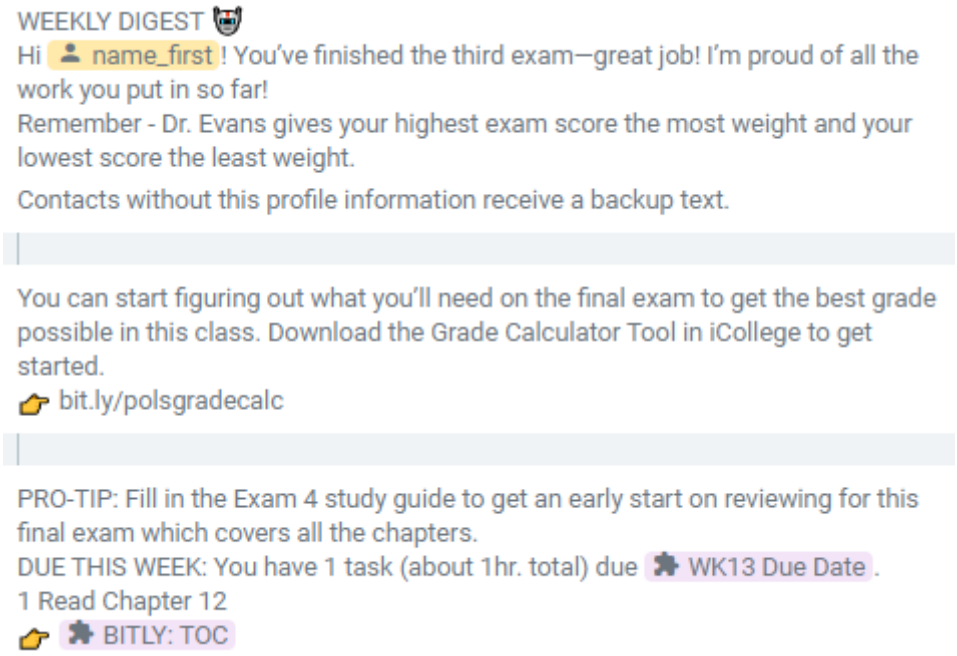
Hi name_first ! This is a friendly reminder that Exam 3 closes tonight @ 11:59pm.
Log into iCollege and click on the Exam 3 link.
Once you begin, you have 75 minutes to answer 60 questions about the content covered in Chs. 8-11.
I'm here to help. Text me any questions any time. Good luck!

Contacts without this profile information receive a backup text.

WEEK 13 CUSTOMIZED DIGEST_ALL COMPLETE_11.15.2021

Department / Office	Political Science 1101
Purpose	Weekly message reminding students of upcoming due dates sent to students who completed Exam 3 but have not worked ahead this week.
Target Population	182
Successful Contacts	168

Script



WEEK 13 CUSTOMIZED DIGEST_MISSING EXAM 3_11.15.2021

Department / Office	Political Science 1101
Purpose	Weekly message reminding students of upcoming due dates and nudging students to make up Exam 3 sent to students who did not attempt Exam 3.
Target Population	24
Successful Contacts	24
Script	

WEEK 13 CUSTOMIZED DIGEST_WORK AHEAD_11.15.2021

Department / Office	Political Science 1101
Purpose	Weekly message reminding students of upcoming due dates and opportunities sent to students who completed Exam 3 and have already worked ahead on this week's assignments.
Target Population	31
Successful Contacts	29
Script	

ENCOURAGEMENT WK 13_11.18.2021

Department / Office	Political Science 1101
Purpose	Encouraging message sent from Tyler to all students praising them for their work so far this semester and wishing them a relaxing break.
Target Population	225
Successful Contacts	209

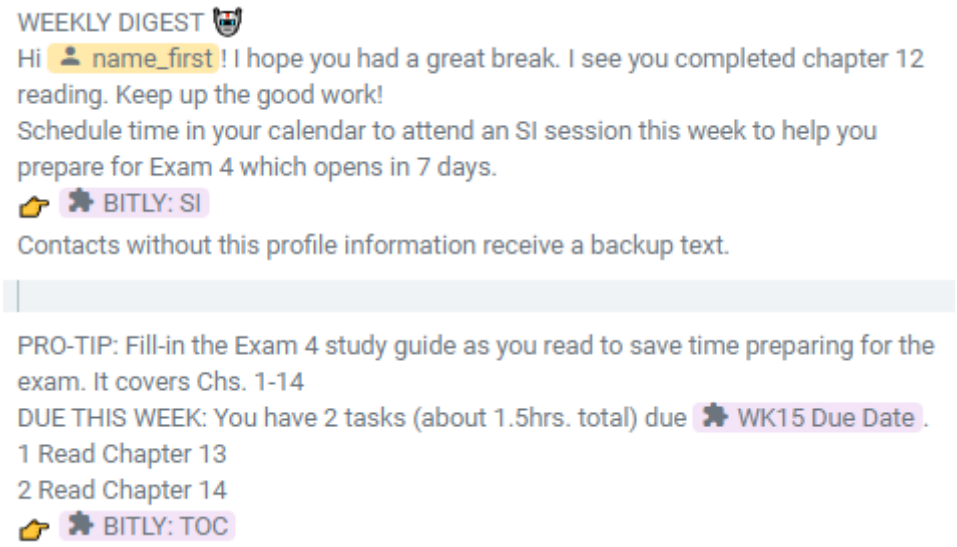
Script

Howdy name_first ! It's Tyler from American Govt. I'm so proud of all the work you've put in this semester. I hope you can take some time to relax and recharge during Thanksgiving Break. Dr. Evans is thankful to have you in POLS1101 this semester. Have a great break!

WEEK 15 CUSTOMIZED DIGEST_ALL COMPLETE_11.29.2021

Department / Office	Political Science 1101
Purpose	Weekly message reminding students of upcoming due dates sent to students who completed all readings since Exam 3.
Target Population	149
Successful Contacts	140

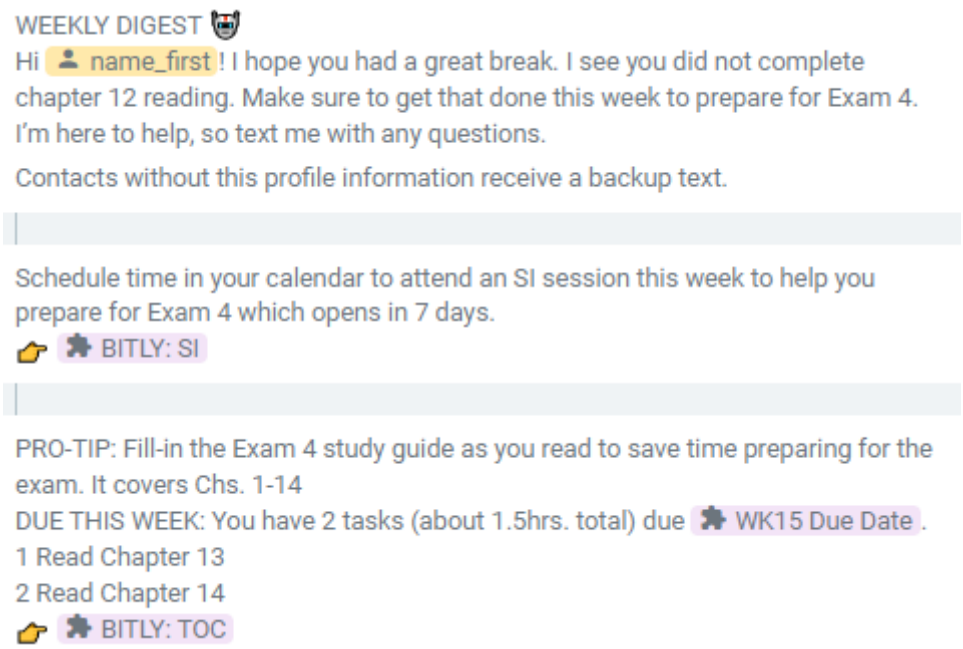
Script



WEEK 15 CUSTOMIZED DIGEST_MISSING_11.29.2021

Department / Office	Political Science 1101
Purpose	Weekly message reminding students of upcoming due dates sent to students who did not complete the readings since Exam 3.
Target Population	67
Successful Contacts	61

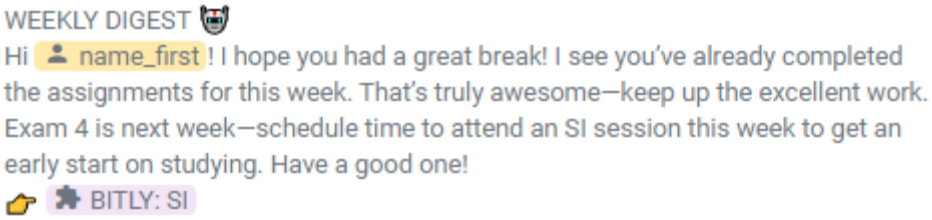
Script



WEEK 15 CUSTOMIZED DIGEST_WORK AHEAD_11.29.2021

Department / Office	Political Science 1101
Purpose	Weekly message reminding students of upcoming due dates.
Target Population	9
Successful Contacts	7

Script



ENCOURAGEMENT WK15_12.02.2021

Department / Office	Political Science 1101
Purpose	Encouraging message sent from Tyler reminding students the final exam is next, it covers every chapter, and about using Demo Mode in Area9
Target Population	225
Successful Contacts	208

Script

Howdy name_first ! It's Tyler from American Govt. The final exam opens 12/6 and closes at 11:59pm 12/10–that's next week! It covers every chapter: 1-14. See the syllabus for more details.
You can use Demo Mode in Area9 to review the chapters more easily. See the video at the link below for instructions.
👉 bit.ly/F21pols1101area9study

WEEK 16 GENERAL DIGEST_12.06.2021

Department / Office	Political Science 1101
Purpose	Weekly digest message reminding students that Exam 4 opens today and closes Friday sent to all students.
Target Population	225
Successful Contacts	200

Script

WEEKLY DIGEST

Hi name_first ! It's exam week in POLS1101.

PRO-TIP: Try #quizme before the exam to make sure you're ready.

DUE THIS WEEK: Exam 4 opens 12/6 – closes @ 11:59pm 12/10. 60 questions in 75 minutes. Covers Chapters 1-14. Good luck!

When all you studied were baby yoda memes and they don't show up on the final.

FAREWELL INTERACTIVE MESSAGE_12.13.2021

Department / Office	Political Science 1101
Purpose	Farewell message wishing them well and asking for their quick feedback on how helpful the bot was for them this semester.
Target Population	225
Successful Contacts	207

Script