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Preparing for class: actions and resources of introductory biology students

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Abstract

Instructors want students to be prepared for class. There are several different resources and activities available to help students prepare for class, but very little is known about how students choose to prepare for class in the context of undergraduate biology. In this study, we used content analysis to investigate what students do to prepare for an introductory biology course, and if and how that preparation differed under two different conditions. Students were either directed to search out and choose their resources to prepare for class (choice treatment) or assigned specific pages from a textbook (text treatment). Students in the choice treatment reported preparing for class slightly more often than students in the text treatment, with both groups reporting that they prepared for over three-quarters of classes. However, students assigned specific textbook passages engaged more while preparing than students who had to find their resources. The textbook was a popular resource but second to websites for students who got to choose. Students in both groups performed similarly in the course. This work helps instructors understand what their students may be doing to prepare for class. We provide recommendations to guide instructors on how to help their students prepare for class.

Keywords: undergraduate, class preparation, biology, content analysis,

Introduction

Instructors almost universally want their students to come to class prepared (1–5). Students who are prepared ask more sophisticated questions and perform better on exams (3). Additionally, for instructors to use beneficial active learning pedagogies, students must be familiar with the material so that they can engage with the content and activities during class time. If and how students prepare for class can be influenced by guidance from the instructor.

Traditionally, instructors ask students to read chapters from a textbook (6–9). Unfortunately, students typically do not complete broad reading assignments (10, 11). When students do read, they often quickly skim the text instead of engaging deeply with the materials (12–15). However, these studies that describe how college students prepare for class are outside the disciplinary context of biology. Understanding how undergraduate students prepare for class, specifically within the disciplinary context of biology, is important as biology discourse and content are unique.

To improve students' interactions with textbooks, biology instructors assign supplementary materials for students to use outside of class such as reading guides (16), quizzes (3, 17), and textbook-affiliated online resources (e.g., Mastering Biology by Pearson Education Inc.; 18). Within classes, instructors also use reading quizzes (19) and clicker-style questions (20) to check for class preparation compliance. Some of these methods are shown to improve reading completion (3) and test scores (16, 17). However, instructors often do not implement these materials because of a lack of awareness, familiarity, or technical support (21). Additionally, instructors may not have the time to create (22) or become familiar with and use these materials (16). Furthermore, textbooks and affiliated resources can be expensive, a cost often shouldered exclusively by students. Therefore, we need to investigate simple and inexpensive instructional interventions for their impact on helping students prepare for class.

One option could be to have the students choose how to prepare for class themselves. We are teaching in an era in which copious amounts of information are freely and quickly available online. Students are incredibly resourceful and commonly use the internet to answer many of their everyday questions (23). Moreover, self-determination theory (SDT) (24) describes choice as a motivating experience. Allowing students to make choices give them autonomy in their studies which increases intrinsic motivation (25, 26). Additionally, Enhanced Affective Engagement Hypothesis states that giving students choices increases their attitude, satisfaction, and effort in

learning (27). However, giving students choices on what materials they use (i.e., resources) and how they use those materials (i.e., actions) to prepare for class is understudied in the context of undergraduate biology courses.

In this study, we investigated the resources and actions students in an undergraduate introductory biology course used to prepare for class. Furthermore, we investigated if that preparation differed between students who were assigned either specific textbook readings or the freedom to choose their resources and actions. Finally, we explored whether course performance was affected by how students prepared for class. We hypothesized that the two treatments would result in students preparing differently, and that the actions and resources students used to prepare for class would affect course performance.

Methods

This work was conducted with approval from the institutional review board at Northern Illinois University (#HS17-0259).

Study Context

This study was conducted at a large four-year, doctoral-granting, regional comprehensive university in the Midwestern United States. The course was introductory cellular biology for biology and related majors. The course met three times a week for 50 minutes and was taught in a large, auditorium-style, lecture hall with enrollment around 100 students per term. The course was student-centered and used active learning (28) with about 40% of class time used for students to work together on projects and discussions, including think-pair-shares and creating models. Course topics included the chemistry of biology, structure and function of large biomolecules and cellular components, metabolic processes, gene expression and regulation, and inheritance.

Study Design

We ran two treatments over two semesters using a quasi-experimental approach (29). For both semesters, one author was the instructor, the same topics were covered, and the format of the courses was the same. In the spring of 2018, students chose what resources they would use to prepare for class (referred to as “choice treatment”). In the spring of 2019, students were assigned specific, narrow readings from a textbook to complete before class (referred to as “text treatment”).

For the choice treatment in 2018, we gathered and analyzed data from 91 consenting students out of a total class population of 117 (consent rate of 78%). For the text treatment in 2019, 61 out of 89 students (consent rate of 69%) were included in the study. Students from both treatments had similar demographics and backgrounds (Table

1). There were no statistical differences between the treatment groups according to χ^2 analyses for categorical factors (i.e., gender, age group, race/ethnicity, class, first generation, transfer status) and t-test for GPA.

[TABLE 1 HERE]

Assignment

Throughout the semester, students were assigned a list of topics to familiarize themselves with before being covered in each class. This assignment was introduced to students during the first day of class both orally and with an assignment sheet (Supplemental Material S1 - choice treatment, Supplemental Material S2- text treatment). The assignment sheets gave a rationale for the assignment, provided learning goals and objectives, explained how to complete the assignment, described how the assignment would be graded, and listed out a schedule of topics for each class.

As evidence of their preparation, students submitted answers to questions in an online form before every class for which they prepared, herein called an "entry." The questions included: what day they prepared for; if they read the assigned pages (text treatment only); what (else) they did to prepare (i.e., action), what resources they used to prepare (choice treatment only), what they learned during the preparation, and what questions they had regarding the material that arose during the preparation. Submitting an entry for the assignment was one of the ways that students could earn completion points for a participation grade that counted towards 10% of their course grade. Students were given other opportunities (i.e., in-class participation) and slightly more opportunities than necessary to earn the maximum amount of participation points. To earn all the participation points, students had to submit a least 30 entries out of the possible 39.

Students in the choice treatment were tasked with choosing their resources to learn about the listed topics. They were given several example resources such as a specific recommended textbook, lecture slides, videos, and practice questions (Supplemental Material S1). Students in the text treatment were assigned narrowed, specific pages from the required textbook that aligned with the topics for each class (Supplemental Material S2). Text treatment students were asked to report additional actions they engaged in besides reading the assigned textbook pages.

Analysis

Students self-reported how they prepared for classes by completing an entry before each class (30). We analyzed the quantity of entries, as well as the number of actions and resources students reported per entry. We compared the quantity of entries students submitted to the quantity we expected from students to earn full participation points (30) and the maximum quantity of entries possible (39). The maximum number of entries was different from the expected because students had flexibility in how they could earn full participation points, with these assignments and in-class participation. We compared the quantities of entries, actions, and resources per entry per student between choice and text treatments using linear models. Additionally, we compared course performance between the two treatments using students' end-of-semester percentages. All models were run using the lme4 package (31) in R (32). The standardized effect size of Hedges' g was used to estimate the magnitude of change for unequal sample sizes (33).

Further, we coded each entry for the actions students reported doing and the resources students reported using. Students could report doing multiple actions and using multiple resources per entry; therefore, each entry could have multiple codes. Two researchers used thematic content analysis (34) to iteratively draft and define codes into codebooks that were used to analyze entries for actions (Supplemental Materials S3), resources (Supplemental Materials S4), and websites (Supplemental Materials S5). After creating complete codebooks, two researchers co-coded 10% of the entries and agreed on 83% of the entries. Disparate codes were discussed until agreement was reached and the codebooks were revised accordingly.

Further, we examined if students prepared differently based on the grade they earned in the course. We performed MANOVA analysis to examine the relationship between students' entries, actions, or resources based on grade bins (A-F) that students earned at the end of the course. Additionally, we performed ANOVA analysis with post-hoc Tukey tests to examine the relationship between grades within choice and text groups. We used the SPSS package for these statistical analyses with alpha set at 0.05. Further, we qualitatively examined the students' entries for any patterns among grade bins regarding the types of actions students took to prepare for class and the types of resources they used.

Results

By examining students' entries, we compared how each treatment (choice, text) affected (a) if students prepared for class, (b) the actions students engaged in, and (c) the resources they used to prepare for class. We used

these comparisons to also describe how these introductory biology students prepared for classes overall. Additionally, we evaluated if the treatments affected course performance.

Did the treatment affect *if* students prepared for class?

Many students prepared for most of the classes regardless of treatment. There was no significant effect for treatment, $F(1, 150) = 1.83$, $p = .178$, Hedges' g = 0.2 (Figure 1A), on the number of times a student reported preparing for class over the semester between choice ($M = 25$, $SD = 9.2$) and text ($M = 23$, $SD = 9.2$). However, a slightly higher percentage of entries were submitted from students in the choice treatment (84% out of the expected number of entries) compared to students in the text treatment (77%). Similarly, only a single entry from the choice treatment reported doing "nothing"; whereas 69 entries (5%) from 17 students (25%) in the text treatment reported doing "nothing" (Table 2). Students were allowed to report doing "nothing" but still got points for the assignment to help mitigate the limitation of relying on self-reported data.

[FIGURE 1 HERE]

Did the treatment affect *how* students prepared for class?

We investigated the common actions and resources students reported and compared between the two treatments. Additionally, we examined if students prepared differently based on the grade they earned in the course.

Actions

Students commonly reported doing multiple actions to prepare for a class. Students in the text treatment reported more actions per entry ($M = 1.7$, $SD = 0.6$) than students in the choice treatment ($M = 1.4$, $SD = 0.4$), $F(1, 150) = 9.4$, $p = .0026$, Hedges' g = 0.6 (Figure 1B). Likewise, students in the text treatment described doing more than one action in 61% of entries compared to only 32% of entries from the choice treatment.

Students reported reading most frequently in both treatments with 80% of entries in the choice treatment and 94% of the entries in the text treatment reported reading either by itself or with another action (Table 2). Students in the choice treatment most frequently reported only reading (52%), whereas students in the text treatment reported reading as the only action in 34% of entries, which was second to the combination of reading and taking notes (55%) (Table 3). Similar proportions of entries from the two treatments also reported reading along with watching videos and quizzing (Table 3).

[TABLE 2 HERE]

There were additional differences in the actions students reported between the two treatment groups (Tables 2 and 3). Students in the choice treatment more frequently reported watching videos (29% of entries) compared to students in the text treatment (9%). Other activities—such as quizzing, doing homework assignments, and working with classmates—were reported at low and similar frequency for both treatments. More entries from students in the text treatment (56%) reported taking notes than the choice treatment (22%) (Table 2).

[TABLE 3 HERE]

Resources

Most often, students used one resource to prepare for each class (Figure 1C). There was no significant effect for treatment, $F(1, 150) = 0.09$, $p = .76$, Hedges' g = 0.1 (Figure 1C), on the number of resources students reported using to prepare for each class between choice ($M = 1.20$, $SD = 0.27$) and text ($M = 1.18$, $SD = 0.44$).

The treatments differed in the types of resources students reported using to prepare for class (Table 4). Students in the text treatment relied primarily on the assigned textbook passages (90% of entries). Students in the choice treatment used a wider variety of resources to prepare for class with the most frequent resource being websites (52%). Websites were almost equally divided between watching a video (29%) or reading text (27%). Other resources used frequently by students in the choice treatment were the recommended textbook (36%) and lecture slides (18%).

[TABLE 4 HERE]

Students in the choice group used several different websites to prepare for class with two general media being the most common: video and text. YouTube and Khan Academy were the most frequently named websites, which use videos to present content through combining visual, oral, and written explanations. Other websites that students used presented content similarly to textbooks (Table 5, "Textbook-like" category) which had mostly text and some figures. A small proportion of students reported accessing research literature from sites such as nih.gov and nature.com. The category of "Other" were websites that were infrequently reported, or the details were not provided.

[TABLE 5 HERE]

Grade Bins

We used quantitative analysis to explore the relationships between the choice and text groups based on grades for the number of entries, actions, and resources (descriptive statistics in Table 6, plots in Supplemental Materials S6). None of the relationships were significant (Table 7).

[TABLE 6 HERE]

[TABLE 7 HERE]

However, when we examined the relationship between grades within choice and text groups using ANOVA, we found a significant difference within the text group (F = 13.296, p = 1.8898E-7) but not within the choice group (F = 2.299, p = .066). The number of entries for students who earned Fs was significantly lower than for all other grades (A: MD = -21.95, p = 6.7269E-7, CI (-31.78, -12.13); B: MD = -19.11, p = 3.6106E-7, CI (-27.44, 10.79); C: MD = -14.042, p = .000195, CI (-22.49, -5.59); D: MD = -12.167, p = .006, CI (-21.7, -2.63)). The numbers of entries for students who earned Ds was also significantly lower than for students who earned As (A: MD = -21.952, p = 6.7269E-7, CI (-31.78, -12.13)). Statistics for non-significant Tukey test relationships are not shown.

We also examined entries organized into grade bins qualitatively but found no consistent and noteworthy themes among the grade bins.

Did the treatment affect course performance?

There was no significant effect for treatment, $F(1, 148) = 0.34$, p = .56, Hedges' g = 0.1 (Figure 1D), on students' course grades between choice (M = 77%, SD = 11.5) and text (M = 76%, SD = 13.3). Similarly, course grades from the complete student populations were also similar between semesters which correspond to the treatment groups.

Discussion & Implications

Instructors want their students to be prepared for class. But little is known about how students prepare for daily class sessions in undergraduate, introductory biology. Further, while several interventions are publicly available and improve student outcomes, some can be expensive, and instructors have been slow to incorporate them into courses. Moreover, little is known about how these interventions affect if and how students prepare for class. Here, we described if and how introductory biology students prepared for class and compared between students who chose for themselves how to prepare or were provided specific textbook reading passages. Looking at course outcomes, we did not detect any significant differences in how students performed in the course between the two

238 treatments. This may be due to both treatments setting an explicit and concrete expectation for students to prepare
239 for class and incentivizing them to do so.

240 Nevertheless, having students prepare for class is an important and meaningful outcome. Here, the students
241 who earned higher grades reported preparing for class significantly more than students who earned lower grades, at
242 least in the text treatment, suggesting that preparing for class is correlated to positive learning outcomes. Similarly,
243 others report that science students who are prepared for class ask more sophisticated questions and perform better on
244 exams (3). Therefore, getting students to prepare for class is important for learning. Below we discuss how our
245 findings, along with relevant literature, support specific recommendations for helping to guide students to prepare
246 for class.

247 Students seemed to work toward meeting the expectation to prepare for class. Here, students reported
248 preparing for 63% of all classes, which is 81% of the classes that they were required to report on to get full points
249 for the assignment (Figure 1A). In other studies that gave students guidance and an expectation to prepare for class,
250 students were more compliant and often had improved learning outcomes (3, 16–18). Conversely, in a study in
251 which the instructors' expectations were not described, less than 30% of students read their textbook chapters
252 completely (5). Others report that first-year college students are unsure about how to prepare for class and may not
253 understand professors' expectations (35). Together, this suggests that instructors' explicit guidance, expectations,
254 and accountability may motivate students to prepare for class. Therefore, we recommend that instructors be explicit
255 about their expectations and incentivize students to prepare for class.

256 Giving students choices on how to prepare may motivate them to prepare for class. Here, students in the
257 choice treatment reported preparing for slightly more classes than students in the text treatment, although this
258 difference was not statistically significant. This increase in preparation could have been mediated through Self-
259 Determination Theory and the Enhanced Affective Engagement (EAE) Hypothesis, which assert that giving students
260 choices increases their attitude, satisfaction, and effort in learning (24, 26, 27). However, studies on the EAE
261 hypothesis show mixed results particularly related to effects on cognitive outcomes. For example, psychology
262 students, who were allowed to make choices about the pacing of their learning and reading tasks, reported being
263 more interested and enjoyed the activities more than students who were not given choices; however, cognitive
264 outcomes did not increase, and some students even had a decrease in cognitive processing (27). Similarly, we did
265 not see any significant differences in overall course performance between the two treatments (Figure 1D). One

possible explanation for not detecting a major difference in course performance is that these class preparation assignments were just one factor among many that influence course performance. Nevertheless, when tasked with choosing, students prepared for class more often which is a meaningful outcome. Therefore, we recommend that instructors give students choices for how they should prepare for class to help motivate them to do so. Further research is needed to determine how choices affect students' participation in class and learning at a fine-grained level, similar to what others have done with specific class preparation assignments (16, 17).

Providing quality options from which students choose may help students engage more with the resources. Here, students used one resource, regardless of treatment, but students in the text treatment reported doing more actions than students tasked with finding their own resources. This can be interpreted with cognitive load theory which describes people's ability to process information (36). One aspect of cognitive load theory is resource depletion which occurs when the thinking required for one task decreases performance on another because there are not enough cognitive resources available to complete the second task (37). Applied to the current study, this suggests that students in the choice treatment may have used their available cognitive resources to identify the content materials (i.e., resources), so they did not complete as many actions with the material after it was found. Whereas students in the text treatment were able to exert more cognitive resources on engaging with the materials because the materials were provided. Therefore, we recommend that instructors should shoulder this burden of finding multiple resources for students so that students can apply their cognitive resources to understanding the content, unless perhaps a goal of the course or lesson is that students develop information literacy skills of finding credible sources of scientific information.

Provided options could reflect students' own choices for resources. Here, students relied on the textbook, even when it was optional, with 36% of choice treatment entries reporting using a textbook. This reliance may stem from being asked to use textbooks in previous coursework. Most of the students in our study were university freshmen or sophomores, and therefore proximal to their high school experience where courses rely heavily on reading textbooks (38, 39). Likewise, college professors often expect students to read textbooks to become familiar with the course material and to enhance learning (10, 40). These experiences may influence students' choice. Furthermore, students commonly used websites that presented information that is similar to textbook formatting. This may be due to a desire for familiarity or simply availability. More work needs to be done to investigate why

293 students choose certain resources. Nevertheless, our evidence suggests that instructors should include a textbook-
294 like option as a resource for students to prepare for class.

295 Another consideration for providing content options for students is the platform or medium in which the
296 information is provided. Traditional media are printed textbooks; however, there are more choices available for
297 students today. For example, students in the choice treatment frequently reported using a website to prepare.
298 Choosing websites to prepare instead of printed textbooks may be due to generational preferences. While
299 Millennials (those born between 1980-1994) prefer printed books for learning, members of Gen Z (those born
300 between 1995-2005) prefer using a screen–videos, games, or apps–for learning (41). The internet may be an
301 important consideration for students because of the ease of access and multiple ways to interact with content.
302 Additionally, with the availability of open access materials, more of these resources may be available at a lower cost
303 than traditional textbooks and appear to be just as effective as traditional textbooks for student learning (5). More
304 research is needed to determine if certain media are more effective than others in helping students prepare for class
305 and learn biological content and which resources students are most motivated to use.

306 **Limitations**

307 The data presented here are self-reported and therefore may not have been a perfect reflection of student's
308 behavior. We tried to mitigate this by making the assignments proximal to the behavior (due before every class), low
309 stakes, for completion points, and gave points for honest reports of doing "nothing." Future research will focus on
310 collecting data on how much time students spent preparing for class and the effectiveness of different class
311 preparations on in-class engagement and fine-grained learning.

312 **Conclusion**

313 In this study, we examined if and how introductory biology students prepared for class, comparing between
314 two simple interventions**.** Our findings further support that having students prepare for class is an important goal.
315 Additionally, our findings suggest that giving students the freedom to find and choose their materials may have
316 motivated them to prepare for class but expended cognitive resources leading to less engagement with the materials.
317 Considering how students prepare and having simple assignments to help guide students, that instructors are likely
318 to use, are vital in helping students be ready to engage in class.
319

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Table Legends

Table 1. Student demographics of consenting students involved in the study. Students in the choice treatment had freedom to choose whatever resources they deemed appropriate to prepare for class and students in the text treatment were assigned specific readings from the textbook to complete before class.

Table 2. Actions students reported when preparing for class comparing between the choice and text treatments. Data are shown as frequency and percentage out of the total entries. Each entry could have multiple actions; therefore, percentages add up to more than 100%.

Table 3. Most common combinations of actions in entries students reported when preparing for class in the choice and text treatments. Data are shown as frequency and percentage out of the total entries.

Table 4. Resources students reported when preparing for class in the choice treatment and text treatment. Data are shown as frequency and percentage out of the total entries. Each entry could have multiple resources; therefore, percentages add up to more than 100%.

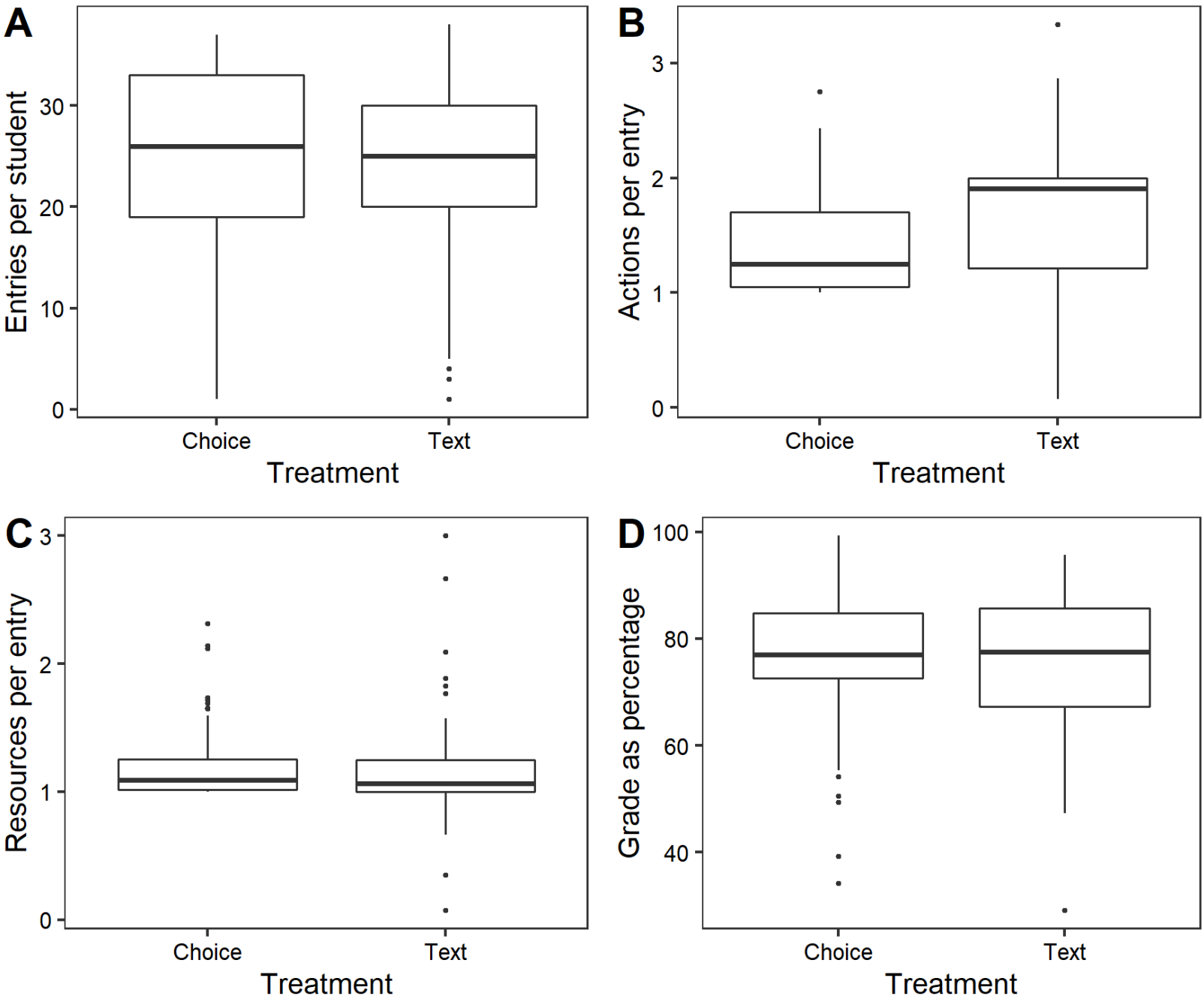
Table 5. Websites students in the choice treatment reported using to prepare for class. Each entry (N = 1186) could have multiple websites; therefore, percentages add up to more than 100%.

Table 6. Descriptive statistics for entries, actions, and resources by treatment and the grades students earned in the course.

Table 7. MANOVA results for entries, actions, and resources based on grades students earned in the course**.**

Figure Legends

Figure 1. Comparison of the two treatments of choice and text for (A) the number of entries submitted per student over the semester, (B) the number of actions students reported per entry, (C) the number of resources students reported per entry, and (D) course performance as overall percentage at the end of the semester.


A
Entries per student
30
20
10
0
Choice
Text
Treatment
B
Actions per entry
3
2
1
0
Choice
Text
Treatment
C
Resources per entry
3
2
1
0
Choice
Text
Treatment
D
Grade as percentage
100
80
60
40
Choice
Text
Treatment

	Choice % (n)	**Text** % (n)
N	91	61
Females	69% (63)	80% (49)
Males	31% (28)	20% (12)
18-21 years	82%(75)	84% (51)
22-25 years	12% (11)	13% (8)
26-40 years	5% (5)	3% (2)
White/Non-Hispanic	54% (49)	48% (29)
Hispanic or Latino/Latina	12% (11)	5% (3)
Black or African American/Non-Hispanic	12% (11)	18% (11)
Asian	10% (9)	13% (8)
Multiple Ethnicities	12% (11)	16% (10)
Freshman	36% (33)	31% (19)
Sophomore	29% (26)	43% (26)
Junior	24% (22)	20% (12)
Senior	8% (7)	7% (4)
Graduate or Postbacc	3% (3)	0
First Generation	53% (48)	48% (29)
Transfers	26% (24)	25% (15)
Cum. GPA (SD)	3.0 (0.8)	3.0 (0.7)

Table 2. Actions students reported when preparing for class comparing between the choice and text treatments. Data are shown as frequency and percentage out of the total entries. Each entry could have included multiple actions; therefore, percentages add up to more than 100%.

Action categories	**Choice** % (n) (N=2298)	**Text** % (n) (N=1415)
Read	80% (1834)	94% (1330)
Took notes	22% (497)	56% (794)
Watched video	29% (655)	9% (121)
Quizzed self	7% (153)	4% (52)
Other	3% (78)	5% (73)
Nothing	0.04% (1)	5% (69)

Table 3. Most common combinations of actions in entries students reported when preparing for class in the choice and text treatments. Data are shown as frequency and percentage out of the total entries.

Combination categories	**Choice** % (n) (N=2298)	**Text** % (n) (N=1415)
Read and Took notes	18% (409)	55% (783)
Read and Watched video	9% (203)	8% (116)
Watched video and Took notes	6% (141)	5% (76)
Read and Quizzed self	6% (130)	4% (50)
Took notes and Quizzed self	3% (68)	3% (47)
Read and Other	2% (57)	4% (59)

Table 4. Resources students reported when preparing for class in the choice treatment and text treatment. Data are shown as frequency and percentage out of the total entries. Each entry could have reported multiple resources; therefore, percentages add up to more than 100%.

Resource categories	**Choice** % (n) (N = 2298)	**Text** % (n) (N = 1415)
Textbook	36% (820)	90% (1273)
Websites	52% (1186)	9% (129)
Slides	18% (423)	5% (64)
Other	4% (92)	7% (95)
Notes	2% (47)	5% (69)
Nothing	0.04% (1)	5% (69)

Table 5. Websites students in the choice treatment reported using to prepare for class. Each entry (N = 1186) could have reported multiple websites, therefore percentages add up to more than 100%.

Website categories	**Frequency** % (n)
YouTube	46% (545)
Textbook-like	30% (357)
Khan Academy	24% (290)
Other	5% (61)
Simulations	3% (40)

Table 6. Descriptive statistics for entries, actions, and resources by treatment and the grades students earned in the course.

	N		Mean # of Entries		Mean # of Actions		Mean # of Resources	
Grade	Choice	Text	Choice	Text	Choice	Text	Choice	Text
A	9	7	32.00	31.29	1.18	1.56	1.06	1.08
B	29	18	26.97	28.44	1.34	1.53	1.16	1.09
C	32	16	23.94	23.38	1.49	1.72	1.23	1.23
D	8	8	22.00	21.5	1.56	2.17	1.31	1.23
F	6	6	21.33	9.33	1.16	1.86	1.08	1.67

Table 7. MANOVA results for entries, actions, and resources based on grades students earned in the course**.**

	Λ	F (5, 6)	p
Entries per grade (A-F)	0.374	2.010	0.210
Actions per grade (A-F)	0.240	3.809	0.067
Resources per grade (A-F)	0.451	1.460	0.326