

Board 96: Exploring the Impact of Textbook Costs on Undergraduate Engineering Majors

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Abstract

In the fall of 2022, the Dartmouth Library and the Thayer School of Engineering launched an exploratory survey to determine the amount spent on textbooks by declared engineering majors in all classes, and the impacts of these costs on student experiences. The goals of this investigation were to determine the average costs incurred by engineering majors, the academic and financial impacts of the costs on students, and how students were paying for their textbooks. This knowledge will help identify where the library can provide additional support for course texts and OER. This survey served as a pilot for a university-wide survey looking at the costs associated with textbooks in various disciplines, launched in April 2023. The goal of presenting this exploration is to encourage similar explorations at other small, private colleges.

Introduction & Methods

Though the impact of textbook costs has been investigated by various institutions and organizations, most research has taken place within community colleges and public universities. Very few studies from small, private colleges have been published [1], [2], [3], and none of these are from similar universities. While our search did reveal several papers on engineering textbooks and open textbooks, none focused on the cost of textbooks for engineering students. While this paper examines the cost of textbooks from the perspective of engineering students, it does not focus solely on engineering textbooks.

In the fall of 2022, the Dartmouth Library and the Thayer School of Engineering launched an exploratory survey to determine the amount declared engineering majors spent on textbooks across their classes. At Dartmouth College, major declarations occur at the conclusion of sophomore year, therefore junior and senior engineering majors were the target audience for the survey. Because Dartmouth is a liberal arts college, engineering students must take courses in art, literature, thought, international study, social analysis, quantitative or deductive sciences, natural and physical sciences, and technology and applied sciences [4]. While engineering classes fulfill the science and technology portions, engineering majors take many classes outside of the department. It is important to note this fact because the costs of textbooks for our students extend beyond the school of engineering.

The goals of this investigation were to determine the average spending by engineering majors on textbooks across their classes for the fall 2022 quarter, the academic and financial impacts of these costs on students, and how students mitigated these costs. This knowledge will help identify where the library can provide additional support for course texts and OER. The survey was not intended to be statistically significant, but it was intended to provide an insight into how textbook costs impact students' experiences.

Method

A 20 question survey (Appendix A) was developed, based on questions seen in similar surveys such as the Florida Virtual Campus Textbook Survey [5], the Virginia Course Materials Survey [6], the William & Mary Textbook Survey [7] and others [8]. The distribution of questions on the survey included 4 questions on the current quarters' costs including 1 open response question, 7 questions on general behaviors associated with textbooks including 1 open response question, and 8 demographic questions. The survey instrument received a letter of exemption from the institutional review board in summer 2022. The survey was constructed using the Qualtrics survey platform and delivered directly to the email addresses of students listed as a declared engineering major or minor by the school of engineering. The survey was sent to 222 undergraduate engineering students, largely juniors and seniors, on October 17 and the survey automatically closed on November 1.

Survey Results

The survey received 43 responses. Of the 43 responses, 39 students completed the survey in full, a response rate of 17.5% . Students were not required to answer all questions, which means the total responses per question vary between 41 and 39 responses overall. Because students were required to be enrolled in classes in the 10-week fall quarter, engineering students that were completing work off-campus or not enrolled in classes at the time of the survey were ineligible to complete the survey. In total, 56% of the responses came from seniors and 43% came from juniors enrolled in the Bachelor of Arts in Engineering Sciences (AB) major, with 1% coming from 5th-year Bachelor of Engineering (BE) students. Due to an error in the construction of the survey, the text entry for "Other, please specify" was not properly activated throughout. This may have provided an incomplete picture of some responses but did not damage the overall results.

In the first section of the survey, consisting of 4 questions focused on the current quarter, students were asked about their spending on textbooks for all classes during the 10-week fall 2022 quarter. The majority of students 80% (n=33) reported spending under \$100 this quarter for their books, while 17% (n=8) reported spending more than \$100 this quarter for books (Fig. 1).

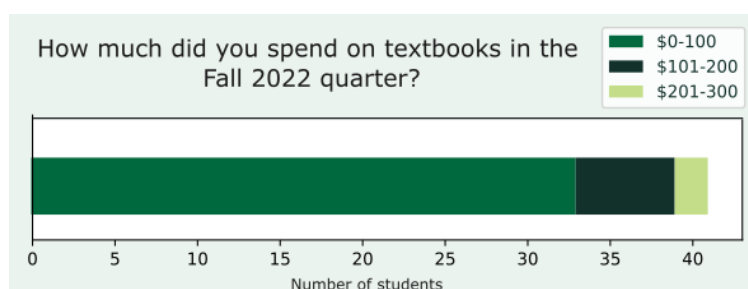


Fig. 1. How much did you spend on textbooks in the fall 2022 quarter?

While 51% (n=21) of students did not feel that cost was a barrier to acquiring their textbooks, 34% (n=14) students felt that cost was a barrier to acquiring their textbooks (Fig. 2).

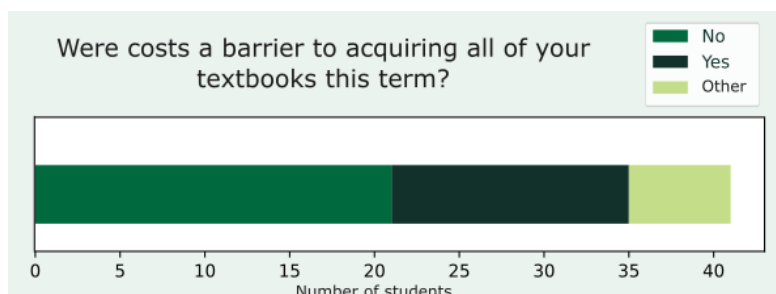


Fig. 2. Were costs a barrier to acquiring all of your textbooks this term?

Of the 41 student responses, only 4.8% (n=2) had financial aid that covered a portion of their textbook costs. For the remaining students, 9.7% (n=4) received no financial aid and 85% (n=35) received financial aid that did not cover textbook costs (Fig. 3).

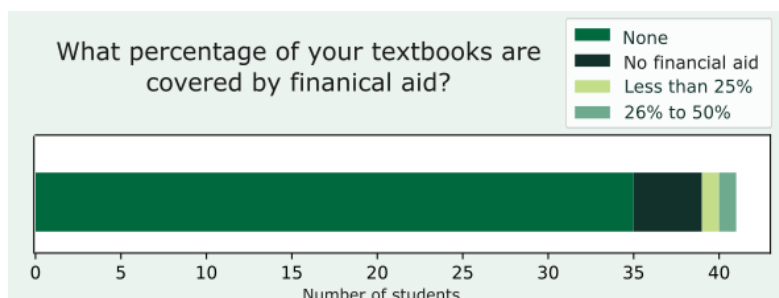


Fig. 3. What percentage of your textbooks are covered by financial aid?

The second section of the survey, consisting of 7 questions about students' behavior regarding textbook acquisition and use, dealt more broadly with the students' time at the college and did not specifically constrain the results to access behaviors within the current quarter.

When students were asked to select all options that applied to how they accessed materials that they did not buy or rent, 92.6% (n=38) of students indicated that they found unofficial copies of their textbooks for free online, 24% (n=10) of students did not attempt to access the textbook in any format, 29% (n=12) of students were given an old copy of a textbook by a past student, and 78% (n=32) of students engaged in some sort of textbook sharing, whether directly with a friend, through course reserves from the library, or using a professor's extra copy (Fig. 4).

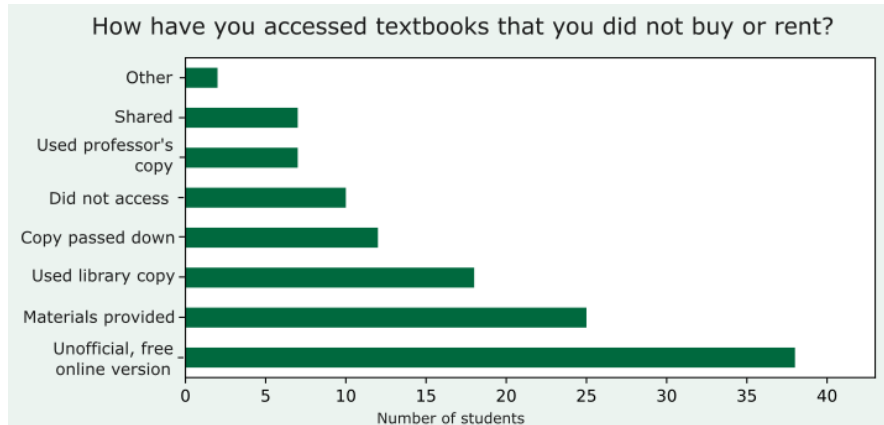


Fig. 4. How have you accessed textbooks that you did not buy or rent?

Overall, 95% (n=39) of students indicated that they took some measures to reduce the costs incurred when accessing textbooks in general (Fig. 5). These measures included buying or renting less expensive formats of the textbook, sharing the textbook with friends or checking out a copy from the library, or downloading an unofficial version for free.

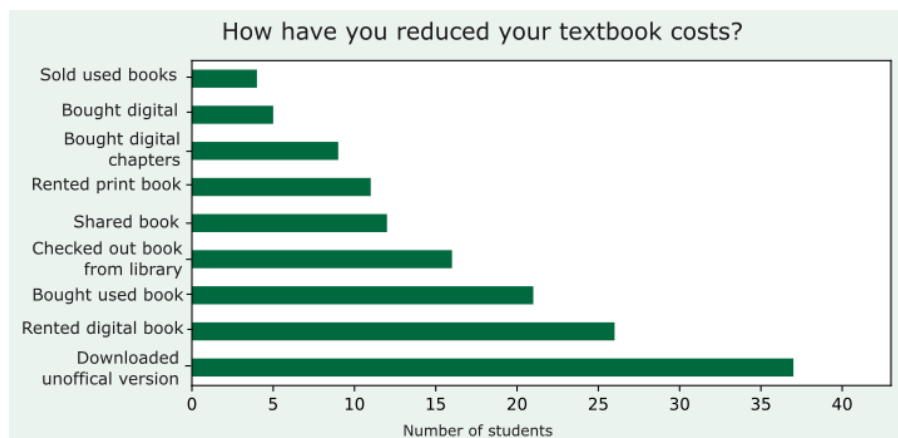


Fig. 5. How have you reduced your textbook costs?

When asked how the cost of textbooks impacted their experience as a student, 69% (n=27) of students reported that the costs of textbooks affected their experience while 31% (n=12) of students felt that their experience was unaffected by the cost of their textbooks (Fig. 6). Of the 27 students that reported their experience was impacted by the cost of textbooks, 74% (n=20) did not purchase a course textbook due to the cost, 14% (n=4) felt they earned a lower grade than if they'd had access to the textbook, 3% (n=1) indicated that they failed a course because they were unable to afford a textbook, 3% (n=1) chose not to enroll in a course they wished to take due to the cost of the course textbook, and 3% (n=1) chose a different major altogether due to textbook costs.

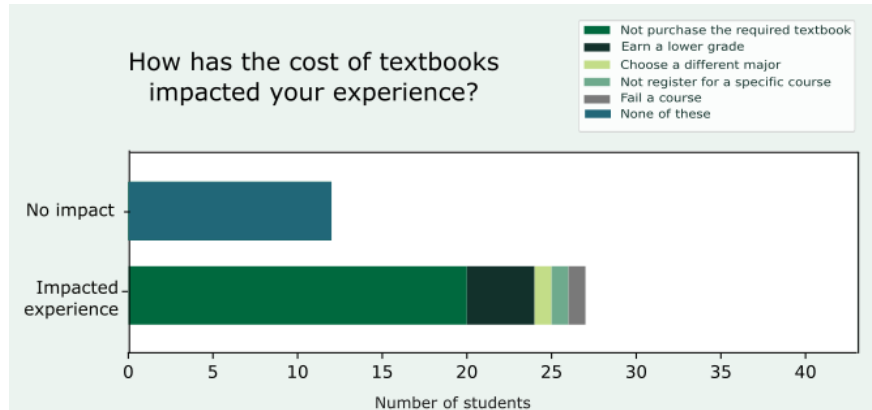


Fig. 6. How has the cost of textbooks impacted your experience?

Of the 20 questions, two questions were open-ended and received a combined total of 24 responses. From the first section, focused on the current quarter, students were given the option to respond to this open-ended question:

4. Please share anything else you would like us to know about textbook costs for the current term.

Question 4 received 17 text responses. From the second section, focused on their time overall at the college, students were given the option to respond to this open-ended question:

11. Please use this space to expand on any of your answers, or to share any other thoughts or experiences about textbook costs at the college.

Question 11 received 7 text responses. Due to their similar nature, the authors chose to code the responses in one codebook. These qualitative responses were hand coded to 11 different codes in 3 code families (Table 1). Some responses aligned with multiple codes causing the total number of items coded to be larger than the total number of responses (n=24).

Table 1: Codes and sub-codes for open-response questions 4 and 11.

Code	# of items
1. Current Uses	
1.1 Download illegally/Free online PDFs	12
1.2 Use copies from the library or on Canvas	5
1.3 Textbook subscriptions & book codes	2
1.4 Renting books instead of buying	2
2. Impacts on Education	
2.1 Costs of textbooks	12
2.2 Use of outdated materials	3
2.3 Impact on class performance	3
2.4 General frustration	3
2.5 Format preference	1
3. Future Ideas	
3.1 Reconsidering what is a “required” book	3
3.2 Provide more library copies or scans	5

The most commonly coded themes were 1.1 “Download illegally/Free online PDFs”, and 2.1 “Costs of textbooks”, with 12 comments each, with 1.2 “Use copies from the library or on Canvas” garnering 5 comments. These align with the results from the rest of the survey indicating that students are frustrated by the cost of textbooks and therefore find “free” copies online, outside of official channels. One student responding to question 4 noted:

I usually just download my textbooks illegally. If I paid, it would easily be more than \$300 per term— I can't afford that.

When tackling how often required textbooks were actually used at all for the course, only 23% (n=9) students said most of the required books were used, with 36% (n=14) selecting that many were used and 31% (n=12) stating only some of their required books were used (Fig. 7).

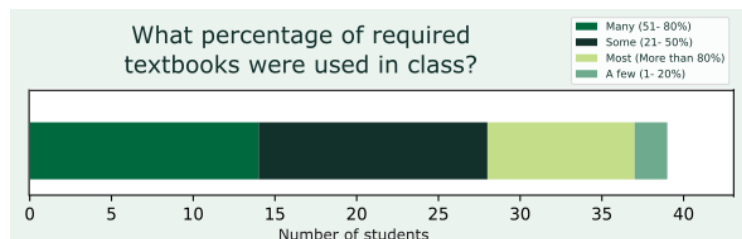


Fig. 7. What percentage of required textbooks were used in class?

This connects directly to 3 responses coded to 3.1 “Reconsidering what is a “required” book” and 4 responses coded to 3.2 “Provide more library copies or scans”, including this quote:

Sometimes professors state they use multiple textbooks but really they end up using one or none. So it would be very helpful if professors were more clear and transparent as to which books we actually need to buy.

Discussion

The results here are similar to results from other institutions. For context, students take about 3 classes per quarter and a total of 36 courses to complete their degree. If we extend the most reported answer of spending \$100 in the fall 2022 quarter on textbooks (Fig. 1), students enrolled in 3 quarters at the college would expect to spend \$300 per year on textbooks. If the total that students are spending in an average year, the college's textbook cost for undergraduate engineering majors is lower than seen in other survey results [5]–[7]. The fact that the overwhelming majority of survey respondents (Fig. 4, 92.6%, n=38) reported using “free” textbooks found online likely skewed their yearly spending far lower than the true amount spent by students if they had to purchase the book in some way. It is particularly concerning that so many students turn to free versions found online as these versions may be out of date, consist of poor quality scans or images, be incomplete, or be inaccessible to those that use assistive devices for studying. Additionally, while it would be nice to know what the students were being asked to spend on textbooks, we felt that there was no simple way to accurately differentiate what we wanted to ask and ensure that students were looking at the publisher cost. In the future, an independent examination of textbook pricing alongside a study of student spending could add clarity to this question.

The responses to “How has the cost of textbooks impacted your experience?” as shown in figure 6 were of particular interest to the authors. The fact that 29/39 students that responded to the question felt that the cost of textbooks negatively impacted their education is notable. While the response pool is not large enough to be statistically significant and the students with the most to say were likely the ones that responded, it is still concerning. That the cost of textbooks caused four students to feel they earned a lower grade and one to fail a course due to lack of access to textbooks, while one chose to forgo a course they were interested in, and another chose a different major due to the cost of textbooks is of particular concern. Information access should not be the reason for a student to leave the field or downgrade their engineering degree.

From the open-ended responses to questions 4 and 11, it became clear that students are encountering frustrations with courses that require students to purchase a textbook access code in order to access online quizzes or other required modules managed through the publisher website. While the topic of textbook access codes was not addressed within this survey, the fact that it surfaced naturally is noteworthy. The use of these access codes adds an additional “pay-to-play” layer to an already expensive educational environment. The use of these codes mean some students may be excluded from coursework due to cost-barriers, negatively impacting their learning outcomes as well as their grades. Overall, students expressed that textbooks should be

less expensive or even free, and many were willing to go out of their way to use library copies in lieu of purchasing textbooks.

While there is some debate in the literature whether course reserves at the library may have the unintended consequence of facilitating unaffordability by allowing the costs of textbooks to grow unchecked [9] or if they make materials access more equitable [10], it is clear from these results that students would be open to accessing more copies through the library. The engineering school averages 41 total seats per course in the undergraduate engineering courses and there are rarely multiple sections of a class. These factors combine to suggest that adding more library copies, whether physical or online, is potentially more viable than at larger institutions with hundreds of students per class or numerous sections. This however is not an ideal solution as, at least with physical materials, course reserves still do not allow students to have unlimited access to the materials to study at their own pace. Students' written answers to questions 4 and 11 expressed frustration with deciphering what materials are listed as “required” while they may or may not be used in class (Fig. 7). This frustration is understandable as any money spent on books incorrectly listed as required is money that cannot be spent elsewhere.

When examining the issue by noting the listed texts in the course catalog, we discovered some professors are assigning old editions of textbooks, sometimes several editions behind the current. While there is nothing inherently wrong with older editions, and assigning whatever edition they please is the prerogative of the professor, it is worth noting that this does not always make the textbook more affordable. When we checked on the books listed for the courses, many older editions were out of print and unavailable, but for those that still had some copies available on the resale market, the cost of these editions was noticeably higher than newer editions. While some professors may assign these books because they prefer those editions, others may assign them believing that older editions are less expensive than newer editions. This demonstrates the need for clearer communication of what books are required and what editions are acceptable to avoid unnecessary costs.

Conclusions

Though the survey indicates that students are spending \$100 per quarter or less, we feel that this is not representative of what students are being asked to spend on textbooks for their courses. Because of this, we are still pursuing ways to make textbooks more affordable to students in the school of engineering and across Dartmouth. We conclude that there are several ways to reduce student textbook costs at the school of engineering.

For professors interested in reducing costs but still planning to use a textbook from a publisher, considering the upfront cost of the current edition and being open to a broader range of editions may help. At an administrative level, professors could be asked to reconsider what they list as a

required text, whether the text is indeed needed in full or if a few chapter scans would suffice, and the overall cost of the material.

Administrators at the school could set a threshold for the allowable book costs for a single course. Another path could include investigating other models of textbook delivery including the adoption or creation of open access materials, or purchasing unlimited electronic access licenses for common textbooks. The curriculum review committee could have a significant impact on the adoption of OER within the school. The creation or adoption of OER materials should also be incentivised in the promotion and tenure process.

Within the library, more money could be allocated to course reserves, though this is unlikely to be the most sustainable solution. Between the library and the school of engineering, the most equitable and long-term solution would require investing both time and money in developing open and accessible textbooks and course materials. Overall, the focus should be on empowering student's learning, and ensuring they have access to the materials they need to meet their learning outcomes.

Future Research

Additional directions for research include a faculty facing survey regarding what factors professors consider when choosing texts, or a study that follows the textbook expenses of individual engineering students and the impacts of that cost across their 12 quarters at the college. The survey has been redeveloped and was launched campus wide in April 2023. Engineering students at both the undergraduate and graduate levels, including undergraduates that have already completed the version discussed here, will be invited to participate. Ideally, this revised campus wide survey will provide a richer landscape of data across our various engineering programs. The results of the campus wide survey will be explored at a later date, and a separate sub-exploration of the results for engineering students will take place in the future.

Lessons Learned

For researchers looking to replicate this study, we have a few recommendations. Within your survey instrument, ensure that your "other, please specify" open responses are activated and any survey questions that ask for "check all that apply" are multiple choice as opposed to single choice. They seem like obvious mistakes now, but no one that reviewed it caught it! When working with the survey data using Python, we discovered that having set options in drop-down menus for majors, minors, or other standardized information was essential for easy visualization as open responses require significantly more data cleaning to process. We revised or removed some questions for the campus wide survey launched in April 2023—if you are interested in the revised instrument please contact the authors for a copy.

Appendix A: Textbook Cost Survey

Start of Block: Welcome

Overview

Mission

To understand the textbook spending practices of Dartmouth students so that the campus administrators and librarians have information useful for programs designed to increase course materials affordability.

- Objective 1: Understand current costs of textbooks for Dartmouth students.
- Objective 2: Understand methods Dartmouth students take to lower textbook costs.
- Objective 3: Understand how the cost of textbooks differs by discipline and degree level.

Guiding Questions (adapted from the 2018 Florida Student Textbook Survey and the 2020 William & Mary Task Force on Textbook Affordability Final Report)

- Question 1: How much do students spend on textbooks and other instructional materials?
- Question 2: How often do students buy textbooks that are not used?
- Question 3: How are students affected by the cost of textbooks?
- Question 4: Comparing undergraduate and graduate students, what are the differences in the money spent on textbooks, costs covered by financial aid, and the number of textbooks purchased but never used?
- Question 5: What are the differences in the money spent on textbooks for students in different degree levels (e.g. Bachelor, Master, Doctoral)?

Distribution

A survey will be administered in fall 2022 to declared engineering majors (junior & senior level students) at the Thayer School of Engineering at Dartmouth College. The survey collects data on what students paid for their textbooks in fall 2022. It also asks about student thoughts, preferences and behaviors associated with required textbooks which are assigned by their professors.

How Will Results Be Used?

Results will be used to inform the university leadership and librarians on this issue and to assess options on ways to address the cost of textbooks at Dartmouth College, including the Thayer School of Engineering.

Survey Introduction

Purpose

Dartmouth Library is leading an effort across campus to understand student textbook costs, spending practices, and buying preferences so that campus administrators have information useful for programs designed to increase course materials affordability. Find out more about Dartmouth's efforts in textbook affordability [here](#).

Voluntary Participation

The survey is estimated to take 5-12 minutes to complete. Participation is voluntary and may be stopped at any time with no consequences or penalties.

Anticipated Risks

There are no known risks associated with participating in this survey.

Privacy and Confidentiality

Student responses will not be linked to individual students. The responses provided will not impact current or future standing at Dartmouth. Anonymized data will be secured within a password protected database.

Benefits of Participation

There are no known benefits for participating in this study. Participation will contribute to research on textbook affordability at Dartmouth.

Incentive for Participation

Students who complete the survey may enter a drawing to win a gift card to Still North Books. Winners will be selected at random and notified within two weeks of the conclusion of the survey.

Contact For more information about the survey, contact any of the following people:

Jentry Campbell, Research & Learning Librarian - STEM

Stephen Krueger, Scholarly Publishing Librarian

You may notify the Committee for the Protection of Human Subjects if any issues arise during this study.

Requirements

Participants must be current Dartmouth students who are 18 years old or older.

Please select whether you agree to participate:

- Yes, I consent to participate in this study.
- No, I do not consent to participate in this study.

End of Block: Welcome

Start of Block: Current Term

1. How much did you spend on textbooks for the current term?
 - \$0-100
 - \$101-200
 - \$201-300
 - \$301-400
 - \$401-500
 - \$501-600
 - \$601 or more
 - Other (please specify)

2. Were costs a barrier to acquiring all of your textbooks?

- Yes
 - No
 - Other (please specify)
3. What percentage of your textbooks are covered by financial aid for the current term?
- None
 - Less than 25%
 - 26% to 50%
 - 51% to 75%
 - 76% to 99%
 - All of my costs
 - I do not receive financial aid
 - Other (please specify)
4. Please share anything else you would like us to know about textbook costs for the current term:

End of Block: Current Term

Start of Block: General Habits

5. In your time at Dartmouth, how often have you purchased required textbooks?
- Always (More than 80% of the time)
 - Mostly (51- 80% of the time)
 - Sometimes (21- 50 % of the time)
 - Rarely (1- 20% of the time)
 - Never
 - Not applicable
 - Other (please specify)
6. Which sounds most like you?
- I buy or rent all textbooks for my courses, required and optional
 - I buy or rent only textbooks that are required for my courses
 - I rarely buy or rent textbooks for my courses
 - I never buy or rent textbooks for my courses
 - Other (please specify)
7. In your time at Dartmouth, how have you accessed textbooks that you did not buy or rent? Select all that apply.
- The materials were provided free of cost
 - I found an unofficial, free online version
 - I borrowed a copy from the professor or department
 - I shared with a classmate
 - A copy was passed down to me from a previous student
 - I used a copy from the library
 - I did not attempt to access the materials

Other (please specify)

8. In your time at Dartmouth, what measures have you taken to reduce your textbook costs?

Check all that apply.

- Bought used copies
- Rented printed textbooks
- Rented digital textbooks
- Rented only the digital textbook chapters needed for the course
- Checked out the textbook from the library
- Shared books with classmates
- Bought lifetime access to a digital version of a textbook
- Downloaded an unofficial version of a textbook from the Internet
- Sold used textbooks
- I did not attempt to reduce textbook costs
- Other (please specify)

9. In your time at Dartmouth, what percentage of required textbooks have you actually used for the classes for which they were assigned?

- Most (More than 80%)
- Many (51- 80%)
- Some (21- 50%)
- A few (1- 20%)
- None – I have not used any of my required textbooks.

10. In your time at Dartmouth, has the cost of textbooks caused you to do any of the following?

- Take fewer courses
- Not register for a specific course
- Drop a course
- Withdraw from a course
- Earn a lower grade than if I'd had access to the textbook
- Fail a course because I could not afford to buy the textbook
- Not purchase the required textbook
- Choose a different major
- Choose a different minor
- Other (Please specify)
- Not Applicable

11. Use this space to expand on any of your answers, or to share any other thoughts or experiences about textbook costs at Dartmouth.

End of Block: General Habits

Start of Block: Demographics

12. In what term and year did you begin coursework at Dartmouth? (e.g. fall 2020)

13. What degree are you seeking?

- Bachelor's
- Master's
- Doctorate
- Other (please specify)
- Not applicable

14. What is your current academic classification?

- First-year
- Sophomore
- Junior
- Senior
- Graduate or Professional Student
- Other (please specify)

15. What is your major?

Display This Question: If 13 = Bachelor's

16. What is your minor, if applicable?

Display This Question: If 13 = Bachelor's

17. What is your school/department and degree program?

Display This Question: If 13 = Master's Or 13 = Doctorate

18. How many courses are you taking at Dartmouth this quarter?

- Two courses
- Three courses
- Four courses
- Other (please specify)

19. Are you a first generation college student?

- Yes
- No
- Prefer not to answer

20. In terms of race and ethnicity, which best describes you? (select all that apply)

- American Indian or Alaska Native
- Asian or Asian-American
- Black or African-American
- Hispanic, Latino, Latina, or Latinx
- Middle Eastern or Northern African
- Native Hawaiian or other Pacific Islander
- White
- Another option not listed here (please specify)

Prefer not to answer

End of Block: Demographics

End of Survey

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