Generative AI Adoption in Higher Education: Evidence from an Elite College*

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Abstract

We examine Generative Artificial Intelligence (AI) adoption and usage patterns among college students using novel survey data from a highly-selective U.S. college. We find strikingly high and rapid AI adoption—81.3 percent of students use AI during the Fall 2024 academic semester, with usage primarily focused on learning support rather than content creation. While students generally perceive AI as beneficial for their academic work, there are substantial gaps in adoption across student characteristics and significant variation in understanding of institutional policies. Students systematically underestimate their peers' AI usage, and these beliefs correlate strongly with their own adoption decisions.

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1 Introduction

Generative Artificial Intelligence (AI) has emerged as one of the fastest-adopted technologies in history, with OpenAI's ChatGPT reaching 100 million weekly users in less than a year (Porter, 2023). AI's potential to transform higher education is immense, enabling tasks such as essay writing, problem-solving, and coding to be completed at instant speed and near-zero marginal cost. While some educators view AI as a transformative tool for learning, others worry it may undermine educational objectives or exacerbate inequities. Despite the intensity of this debate and AI's unprecedented adoption speed, there is a lack of systematic evidence on basic questions like student adoption patterns, inequities in access to these tools, and how usage of AI tools affects the student learning production function.

This paper presents results from a survey of AI adoption at Middlebury College, a small and highly selective liberal arts college located in Vermont. With approximately 2,800 undergraduate students, Middlebury offers over 45 majors across the arts, humanities, languages, social sciences, and natural sciences. Over the last decade, Middlebury has consistently ranked among the top 10 liberal arts colleges in the U.S. News & World Report rankings, with an average ranking of 8.5 between 2015 and 2025. The college's selectivity is comparable to many elite research universities—Middlebury's acceptance rate of approximately 10 percent is similar to that of Boston University (11 percent), Georgetown University (13 percent), and the University of Virginia (16 percent).

This paper presents results from a survey of AI adoption at Middlebury College, a highly selective liberal arts college located in Vermont. Over the last decade, Middlebury has consistently ranked among the top 10 liberal arts colleges in the U.S. News & World Report rankings, with an average ranking of 8.5 between 2015 and 2025. The college's selectivity is comparable to many elite research universities—Middlebury's acceptance rate of approximately 10 percent is similar to that of Boston University (11 percent), Georgetown University (13 percent), and the University of Virginia (16 percent).

To examine how students engage with AI in this environment, we surveyed the student population in December 2024 about their use of AI tools, perceived impacts on academic performance, and responses to institutional policies. The survey collected information about AI model usage, frequency and purpose of use, and perceptions of impact, along with rich demographic and academic data. To minimize selection bias, we framed the survey broadly about technology use and provided substantial incentives for participation,

achieving a 22.2 percent response rate with 617 responses representing a broad cross-section of the student population.

We present five main findings. First, AI adoption among Middlebury students is strikingly high: 81.3 percent use AI during the academic semester, with 13.3 percent using it very frequently, 26.4 percent using it frequently, 21.3 percent using it occasionally, and 20.2 percent using it rarely. This adoption has occurred at an extraordinary pace, with usage growing from around 10.2 percent of students before Spring 2023 to over 80 percent by Fall 2024—a speed of diffusion that exceeds any previously documented technology adoption episode (Bick et al., 2024; McClain, 2024).

Second, there are substantial gaps in adoption across student characteristics. Male students have higher usage rates than females (86.3 vs 78.6 percent), and adoption is particularly high among STEM majors, with Mathematics and Computer Science showing a 92.6 percent adoption rate. Interestingly, students with below-median GPAs report higher AI usage rates than those above the median (85.8 vs 80.8 percent). If AI tools meaningfully aid learning and academic performance these adoption gaps could lead to differential gains across student groups.

Third, students use AI primarily for learning support rather than content creation. The most common uses of Generative AI tools are explaining concepts (81.5 percent) and summarizing texts (75.9 percent), while more controversial uses like writing essays are less common (25.4 percent). Students generally perceive these AI tools as beneficial—70.2 percent believe AI improves their understanding of course materials, and 60.1 percent report improved learning ability. Qualitative evidence from open-ended responses reinforces this pattern, with students viewing AI as a supplementary learning tool, similar to a tutor, rather than a replacement for traditional academic work.

Fourth, institutional policies significantly influence AI usage, but there are important gaps in policy awareness and understanding. While most students (76.9 percent) report understanding when AI use is allowed, only 10.1 percent are aware of their free access to to premium AI tools through the college, and only 32.6 percent know how to properly cite AI use in their academic work. When AI use is explicitly prohibited, 68.8 percent of students report being unlikely to use it, suggesting that institutional policies can effectively shape behavior.

Fifth, we find that students systematically underestimate their peers' AI usage, particularly for academic work. While actual usage for schoolwork is 81.3 percent, students believe only 67.1 percent of their peers regularly use AI for this purpose. Moreover, we

find a strong positive correlation between students' beliefs about peer usage and their own adoption decisions, suggesting that correcting these misperceptions could further accelerate AI adoption.

This paper contributes to a rapidly growing literature examining the adoption and impacts of Generative AI. Recent work has focused on AI's effects on worker productivity (Noy and Zhang, 2023; Brynjolfsson et al., 2023; Dell'Acqua et al., 2023; Peng et al., 2023; Cui et al., 2024) and its potential to transform different occupations (Eloundou et al., 2024). The ultimate impacts of Generative AI depend on its adoption. While several papers document AI adoption in workplace settings (Bick et al., 2024; Humlum and Vestergaard, 2024), and others examine firm-level AI adoption (McElheran et al., 2023; Bonney et al., 2024), evidence on AI adoption in educational contexts remains limited.

In the space of generative AI and education outcomes, a growing number of studies, including Qureshi (2023); Banihashem et al. (2024) and Essien et al. (2024) experimentally test the efficacy of generative AI tools in complementing specific learning tasks. These studies are summarized in meta-analyses by Zheng et al. (2023) and Wu and Yu (2024). Most closely to this paper, Kelly et al. (2023) and Bonsu and Baffour-Koduah (2023) conduct surveys of AI adoption by students in Australia and Ghana, respectively. These studies focus on student's confidence with using generative AI tools. Our study provides the first systematic evidence on how students at a selective U.S. college use AI tools, documenting not only adoption patterns but also how these generative AI tools affects traditional educational inputs like study time, writing, and problem-solving tasks.

We also contribute to the literature that studies how new digital technologies affect student learning. Prior research on technology in education has often focused on the provision of laptops, online homework platforms, or other digital resources, finding mixed evidence on whether these tools complement or substitute for traditional learning inputs (e.g., Fairlie and Robinson, 2013; Bulman and Fairlie, 2016; Ganimian and Murnane, 2016; Muralidharan et al., 2019; Escueta et al., 2020; Major et al., 2021). Our findings extend this literature by examining students' use of generative AI tools, which represent a fundamentally different type of technology.

2 Data: Novel Student Survey

2.1 Recruitment and Structure

We conducted the survey in December 2024. All Middlebury College students were contacted via email and received a reminder a few weeks after the initial invitation. To minimize selection bias, the recruitment materials described the survey broadly as research on students' use of technology in their academic and personal lives, rather than specifically mentioning Generative AI. To incentivize participation, students who completed the survey qualified to enter a lottery for Amazon gift cards ranging in value from $50 to $500. The full survey instrument is provided in Appendix E.

The survey contains three main sections (see Appendix Figure A1 for the survey flow). First, we gather demographic and academic information. This includes gender, race/ethnicity, type of high school attended (private or public), current academic year, and declared or intended major. We also collect data on academic performance through self-reported first-year GPA and typical weekly hours spent studying.

Second, we measure students' experiences with Generative AI tools. We begin by asking whether students have ever used generative AI tools like ChatGPT or Claude, and for those who have, we collect information about their usage patterns. This includes frequency of use during the academic semester, which specific AI models they use, and whether they pay for AI services. We also gather data about how students use AI for different academic tasks, including writing assistance, learning support, and coding.

The final part of the survey elicits students' beliefs about Generative AI's adoption and impacts. We ask students their perceptions about AI's effects on their academic experience across multiple dimensions including learning, grades, time management, and understanding of course material. We then collect information about institutional policies, asking students how different policy environments influence their likelihood of using AI. The survey concludes by eliciting students' beliefs about AI usage among their peers, including their estimates of what fraction of Middlebury students use AI for schoolwork and leisure.

2.2 Sample and Summary Statistics

Out of Middlebury's student population, 617 students (or 22.2 percent) started the survey. This response rate is comparable to that of similar surveys (e.g., National Survey of Student

Engagement, 2020; Wu et al., 2022). We exclude 83 respondents who quit the survey before reaching the Generative AI usage module, leaving us with an analysis sample of 534 students.

Table 1 presents summary statistics for our sample. Panel A shows demographic characteristics. Of the respondents, 45.1 percent identify as male and 50.7 percent identify as female. In terms of race/ethnicity, 62.7 percent identify as white, 3.4 percent as Black, 9.7 percent as Hispanic, and 15.9 percent as Asian. Due to the small sample sizes for individual racial/ethnic groups, in some of our analysis, we collectively refer to Black, Hispanic/Latino, Asian students, and Other/Mixed-Race students as "non-white." About 42.3 percent of students attended a private high school, while 53.6 percent attended a public high school.

Panels B and C present academic characteristics. The sample is relatively balanced across class years, with 31.0 percent first-years, 25.9 percent sophomores, and 21.2 percent each juniors and seniors. The average first-year GPA among non-first-year respondents is 3.73, and students report spending an average of 18.1 hours per week studying outside of class. Mathematics and Computer Science are the most represented fields of study (42.1 percent), followed by Social Sciences (18.4 percent) and Natural Sciences (17.7 percent). Smaller shares of respondents are Humanities majors (11.3 percent), while Arts (4.3 percent), Environmental Studies (3.7 percent), and Languages (2.5 percent) are the least represented fields.

3 Generative AI Usage Patterns Among Students

3.1 Adoption of Generative AI

Generative AI has been adopted at strikingly high rates among Middlebury College students. Figure 1 shows the fraction of students who report using AI during the academic semester. Frequency is divided into four levels: "Rarely" (a few times a semester), "Occasionally" (a few times a month), "Frequently" (a few times a week), and "Very Frequently" (daily or almost daily). Among all students, 81.3 percent use AI during the academic semester, with 13.3 percent using it very frequently, 26.4 percent using it frequently, 21.3 percent using it occasionally, and 20.2 percent using it rarely.

This adoption rate is substantially higher than the general population and other academic settings. Bick et al. (2024) find that only 39.4 percent of the U.S. working-age population had used generative AI in 2024. Recent surveys confirm the relatively low

adoption in the general population—a Pew Research survey found that just 23 percent of U.S. adults had ever used ChatGPT (McClain, 2024), while a Gallup survey found that only a third of U.S. workers have ever used AI at work (Gallup, 2024). Among workers in AI-exposed occupations, Humlum and Vestergaard (2025) find an adoption rate of 41 percent. The adoption rate at Middlebury is also higher than that found in other academic settings—Carvajal et al. (2024) document that 68.9 percent of Norwegian university students in their sample use AI tools either occasionally or all the time.[1]

3.1.1 Adoption by Student Characteristics. There is substantial heterogeneity in AI adoption across student characteristics (Figure 1 and Appendix Table A1, Panels A–B). Males report higher usage rates than female students (86.3 vs 78.6 percent). Asian students have the highest usage rates (91.8 percent), followed by Black students (88.9 percent), while white and Hispanic students report lower rates (80.0 and 75.0 percent, respectively). Students who attended private high schools report higher usage rates than public school students (84.1 vs 78.0 percent). Usage increases somewhat with college experience, from 77.6 percent among freshmen to 87.6 percent among juniors, though it decreases for seniors to 81.4 percent. Interestingly, students with below-median GPA report higher AI usage rates than those above the median (85.8 vs 80.8 percent).

Our findings on heterogeneity in AI adoption partially align with patterns documented in other settings. The gender gap in AI adoption at Middlebury—7.7 percentage points higher for males—is consistently documented across studies, though its magnitude varies: Carvajal et al. (2024) find that male students are 15 percentage points more likely to use AI than female students, while Bick et al. (2024) and Humlum and Vestergaard (2025) document gender gaps of 9 and 16 percentage points respectively in workplace settings. Our finding that students with below-median GPA are 5 percentage points more likely to use AI than those above the median (85.8 vs 80.8 percent) aligns with findings in Carvajal et al. (2024), who document higher adoption rates among students with lower admission grades. As Humlum and Vestergaard (2025) suggests, this could reflect that individuals with less prior expertise have the most to gain from AI tools, potentially making these

[1]Part of the higher adoption rate among Middlebury students compared to the general population can be attributed to the demographic composition of Middlebury's student body: younger and higher-educated individuals are more likely to use AI tools. For instance, Pew Research finds that 43 percent of adults under 30 have used ChatGPT compared to 23 percent of the average U.S. adult (McClain, 2024). Bick et al. (2024) similarly find that workers aged 18–29 are twice as likely to use AI at work compared to those aged 50–64, and that workers with college degrees are twice as likely to use AI at work as those without. Humlum and Vestergaard (2025) and Liu and Wang (2024) document similar age and education patterns.

technologies an equalizing force in academic settings.

3.1.2 Adoption by Field of Study. Generative AI adoption rates vary substantially across academic disciplines (Appendix Table A1, Panel C). Mathematics and Computer Science majors report the highest usage rates (92.6 percent), with particularly intensive usage—21.6 percent use AI very frequently and another 35.8 percent use it frequently. Environmental Studies and Natural Sciences also show high adoption rates at 83.3 and 80.2 percent respectively. Languages has the lowest overall adoption rate at 58.3 percent, with Humanities and Arts following at 69.1 and 71.4 percent respectively.

These differences in adoption rates across academic fields mirror patterns documented in workplace settings. Bick et al. (2024) find stark differences between workers based on their college major: those who studied STEM fields have the highest AI adoption rates (46.0 percent), followed closely by Business/Economics graduates (40.0 percent), while Liberal Arts graduates show substantially lower rates (22.4 percent). Humlum and Vestergaard (2025) document consistent patterns, finding that occupations where writing and technical skills are essential, such as marketing specialists and journalists, have the highest adoption rates. These systematic differences across fields likely reflect variation in both the applicability of AI tools to different academic and professional tasks and the perceived benefits of AI

3.2 Trends in Generative AI Adoption

Next, we study the speed at which Middlebury students adopted Generative AI tools. The speed at which new technologies diffuse through student populations can be informative to predict their future impact. To track the timing of AI adoption among Middlebury students, we asked them when they first began using Generative AI for academic purposes, with options ranging from This semester (Fall 2024)" to Before Spring 2023" (as a reference, ChatGPT's public launch was in November 2022).

Students adopted Generative AI at an extraordinary pace. Figure 2 shows that the cumulative adoption rate grew dramatically from around 10.2 percent of students before Spring 2023 to over 80 percent by Fall 2024. Among current AI users, 30.2 percent started using Generative AI during Fall 2024, while 25.8 percent began in Spring 2023, reflecting sustained momentum in adoption. At this trajectory, adoption should be virtually universal by Spring 2025.[2]

[2]The rate of adoption varies substantially across student characteristics (Appendix Figure A2). Male

The adoption rate among Middlebury students far exceeds that observed in other settings and appears to be one of the fastest technology adoption episodes ever documented. For comparison, Bick et al. (2024) show that it took over 20 years for computers to reach an 80 percent adoption rate in the U.S. working-age population, and about 15 years for internet adoption to reach similar levels. Even Generative AI adoption in the broader population has been markedly slower: Pew Research found that just 23 percent of U.S. adults had ever used ChatGPT as of February 2024, up from 18 percent in July 2023 (McClain, 2024). The dramatically faster adoption rate we document—reaching 80 percent in less than two years—suggests that academic settings may be particularly fertile ground for the rapid diffusion of AI technologies, perhaps due to their clear applications for academic work and students' technological fluency.

3.3 Generative AI Models Adoption

To understand which Generative AI tools students use, we presented respondents with a list of options including both free and paid versions of popular models. The options included ChatGPT, Claude, Google Gemini, Midjourney, and Microsoft Copilot, among others. Students could select multiple tools and specify additional ones not listed. We also asked students how much they pay in monthly subscription costs. Given the typical pricing structure in the AI market at the time of the survey—where standard subscriptions to major models like ChatGPT cost $20 per month—we provided five response options ranging from no active subscription to spending more than $40 monthly.

Open AI's ChatGPT dominates AI usage among Middlebury students, primarily through its free version. Figure 3, Panel A shows that 87.9 percent of students use the free version of ChatGPT, making it dramatically more popular than any alternative model.[3] The next most widely used tools are Google Gemini and Microsoft Copilot, but neither reaches even a 12 percent adoption rate. This pattern mirrors broader U.S. workforce trends, where ChatGPT also dominates among AI platforms (Bick et al., 2024).[4]

students adopted AI tools earlier and at higher rates—by Fall 2024, almost 90 percent of males used AI compared to about 80 percent of females. Students with below-median freshman year GPAs also showed consistently higher adoption than their above-median GPA peers.

[3]There are 29 students who reported never using AI during the academic semester that also reported using ChatGPT during the semester. This pattern may reflect different interpretations of what constitutes "AI use." We include these students in our analysis of ChatGPT adoption but exclude them from analyses of overall AI usage patterns to maintain consistency with their self-reported behavior.

[4]ChatGPT's dominance among the U.S. working-age population is less pronounced than at Middlebury College. Bick et al. (2024) find that ChatGPT leads other models among U.S. adults with 28.5 percent adoption, followed by Google Gemini at 16.3 percent—a much smaller gap than we observe at Middlebury.

Despite widespread adoption of Generative AI tools, relatively few students pay for these services. Figure 3, Panel B shows that only 10.8 percent of students pay for generative AI services, though there is substantial variation across demographic groups. Male students are three times more likely to pay for AI tools than female students (17.2 vs. 5.6 percent). Non-white students show higher willingness to pay than white students (14.9 vs. 8.3 percent), and students from private high schools are more likely to pay than those from public schools (13.0 vs. 9.2 percent). Payment rates vary by class year—from 8.2 percent among freshmen to 15.2 percent among seniors, with sophomores and juniors falling in between at 11.4 and 9.9 percent respectively. These payment patterns suggest that certain student groups may perceive greater value from premium AI features, though the vast majority of students rely exclusively on free versions.

3.4 The Role of AI in Students' Learning Production

How is Generative AI affecting the learning experience of students? The educational production function traditionally includes inputs like time spent studying, faculty instruction, peer interactions, and academic support services. AI tools could complement or substitute for many of these inputs. To assess this, we collected information about how students use AI across ten key academic inputs: proofreading, generating ideas, writing essays, editing essay drafts, coding assistance, creating images, explaining concepts, composing emails, summarizing materials, and finding information. For each task, students indicated frequency of use on a five-point scale. We complemented this quantitative data with open-ended responses about how AI influences their academic work process.

Students use Generative AI for a wide range of academic tasks, with the highest adoption rates for learning support and text processing activities. Figure 4 shows that explaining concepts is the most common use case, with 81.5 percent of students using AI for this purpose. Summarizing texts follows as the second most common application (75.9 percent), followed by generating ideas and finding information (65 percent). Writing assistance tasks like proofreading and editing essays are also common, used by 55.6 and 50.3 percent of students respectively. Technical applications like coding help are less prevalent but still significant, with 41.1 percent of students using AI for programming support. Notably, while 25.4 percent of students report using AI for writing essays, this represents a relatively low adoption rate compared to other academic uses, suggesting students may be more hesitant to use AI for primary content creation. The lowest adoption rate is for creating images at

19.3 percent, likely reflecting fewer academic use cases for this technology.[5]

The patterns of AI use among Middlebury students highlight the importance of the context for studying the adoption of AI. In workplace settings, Bick et al. (2024) find that writing communications and administrative tasks are the most common uses of AI, with 38.4 and 26.8 percent of workers ranking these as their top uses. This contrasts with Middlebury students' primary focus on learning support activities like explaining concepts and summarizing texts. Similarly, Gallup (2024) finds that generating ideas and consolidating information are among the most common uses of AI in the workplace, aligning with the high ranking of these tasks among Middlebury students, though the specific implementation likely differs. Carvajal et al. (2024) finds that retrieving information is the most common academic use of AI, followed by writing tasks, and coding. These comparisons suggest the specific ways AI is integrated into workflows varies significantly between academic and professional contexts, possibly because the demands of each setting are different. For instance, explaining concepts—the most common use among Middlebury students—is likely less relevant in workplace contexts where employees are expected to already possess domain knowledge.

Analysis of open-ended responses sheds further light on how and why students use AI tools (see Appendix C for details). Time savings emerged as the dominant motivation, with 30 percent of responses mentioning efficiency benefits. Students report using AI during periods of high workload and when facing tight deadlines. Many students also use AI as an on-demand academic support tool, particularly for understanding complex concepts when other resources like office hours are unavailable. The responses show clear patterns in which tasks students consider appropriate for AI use. Students express greater comfort using AI to understand material (like summarizing readings or explaining concepts) than to produce content (like writing essays). This aligns with our quantitative finding that adoption rates are higher for explanatory than generative tasks. Finally, students report being selective in their AI use. Many employ AI for specific challenges—like non-native English speakers using it for proofreading or students using it for debugging code—while avoiding it for tasks they view as central to learning. Peer effects also influence adoption; several students reported trying AI after observing classmates use it successfully.

[5]Usage patterns vary somewhat across student characteristics (Appendix Table A2). Black students report the highest rates of intensive AI use, especially for explaining concepts and finding information. Male students use AI more intensively than female students, particularly for finding information and summarizing text. Students with below-median GPAs show higher rates of use for tasks like summarizing and proofreading, while seniors report more intensive use for email writing and essay editing.

4 Perceptions and Norms of Generative AI's Role in Learning

4.1 Student Perceptions of AI's Impact on Academic Experience

Given the widespread use of Generative AI among students, it is important to understand how students believe these tools affect their academic performance. To explore this, we asked students to evaluate how AI impacts various aspects of their learning experience, including their understanding of course materials, learning ability, time management, and grades. For each dimension, students indicated whether they believed AI "significantly improves," "somewhat improves," has "no effect," "somewhat reduces," or "significantly reduces" their performance.

Students generally perceive Generative AI as beneficial for their academic performance, though the perceived benefits vary across different dimensions. Figure 5 shows that the majority of students (70.2 percent) believe that Generative AI improves their understanding of course materials, and 60.1 percent report improved learning ability. Similarly, 59.4 percent report that AI improves their ability to complete assignments on time. Notably, while students believe AI helps their learning and assignment completion, they are less confident about its impact on course grades—41.1 percent believe it improves their grades, while 55.4 percent report no effect and 3.5 percent report negative effects. This pattern suggests that while students perceive Generative AI as enhancing their learning process and workflow—through better understanding, skill development, and timely completion of work—these benefits do not necessarily translate into better course grades.[6]

4.2 Institutional Policies and Student Behavior

Institutional policies have the capacity to shape the adoption and usage of new technologies, such as Generative AI. To understand this relationship, we asked students how likely they are to use AI under different policy scenarios, ranging from complete prohibition to unrestricted use. This analysis is particularly important given the ongoing debate about how universities should regulate Generative AI use in academic settings (e.g., Nolan, 2023; Xiao et al., 2023).

[6]Perceived benefits vary across student groups (Appendix Table A3). Black students report the most positive perceptions, with over 85 percent believing AI improves their learning ability. Male students and those in STEM fields consistently report more positive perceptions than their counterparts. Students with below-median GPAs perceive greater benefits from AI, particularly for course grades, suggesting struggling students may view AI as especially valuable for academic support.

Students' reported likelihood of using Generative AI varies substantially with institutional policy. Figure 6 shows that when Generative AI use is unrestricted, 56.7 percent of students report being likely or extremely likely to use it, with only 23.4 percent being unlikely or extremely unlikely. The patterns are similar when no explicit policy is provided (46.6 percent likely/extremely likely), or when Generative AI is allowed with citation (44.1 percent likely/extremely likely). In contrast, explicit prohibition appears to be a meaningful deterrent: when AI use is prohibited entirely, 68.8 percent of students report being unlikely or extremely unlikely to use it, while only 15.8 percent say they would be likely or extremely likely to use it. These results suggest that institutional policies can significantly influence Generative AI usage patterns, though a small fraction of students report they would likely use AI even when explicitly prohibited.[7]

Our findings on the impact of forbidding AI on usage are similar to those of Carvajal et al. (2024), who estimate that banning AI reduces usage by 37.2 percentage points among females and 20.6 percentage points among males, for an overall drop of about 28.9 percentage points. In our survey, a ban leads to a 37.8 percentage-point decline in usage, with a larger decrease among females (49.6 points) than males (40.1 points). These parallel results underscore how institutional policies can unintentionally produce disparate effects across gender. Notably, these results are not limited to gender. Other demographic and academic characteristics—such as race and GPA—also shape how students respond to policy restrictions (Appendix Table A4), underscoring that institutional policies can produce non-neutral impacts along multiple dimensions.

4.3 Understanding of Institutional Middlebury's Policies and Resources

Given the high rates of Generative AI use, it is important that students understand institutional policies, are aware of available resources, and know how to work with AI in academic settings. To assess this, we asked students whether they find AI use policies in their current classes to be clear, whether they are aware that they have access to the premium version of Microsoft Copilot through the College, and whether they would know how to properly cite AI use in classes that require such citation. We complemented this with an

[7]Policy responses vary across student groups (Appendix Table A4). Male students and Black students report higher likelihood of AI use across all policy scenarios. Math and CS majors show the highest propensity to use AI regardless of policy (68.3 percent when unrestricted), while humanities students report much lower rates (37.7 percent). Students with below-median GPAs consistently report higher likelihood of AI use than their higher-GPA peers, suggesting struggling students may be more resistant to policy restrictions.

optional open-ended question asking students to provide specific feedback or suggestions about Middlebury's AI policies, resources, and support services.

Student understanding of institutional policies is high, but not yet universal. In Figure 7, Panel A shows that most students (76.9 percent) report understanding when and where they are allowed to use AI in their classes, but a substantial minority (20.9 percent) find AI policies unclear. This understanding differs notably across demographic groups. Females report higher rates of policy understanding than males (80.1 vs 72.8 percent), and non-white students show greater understanding than white students (82.2 vs 73.7 percent). There is also variation across academic years, with juniors reporting the highest rate of policy comprehension (83.2 percent) and seniors the lowest (71.3 percent).

The open-ended responses reveal several key themes that help contextualize these quantitative findings (see Appendix D for details). The need for clear guidelines emerged as a dominant concern, with many students requesting more explicit policies about acceptable use cases. Students also strongly emphasize the need for more educational support, with many specifically mentioning the desire for workshops or training on effective AI integration. A recurring theme was the perceived futility of blanket bans, with students noting that prohibition alone is ineffective. This creates fairness concerns, as students following restrictions may be disadvantaged compared to those who disregard them. Many responses advocate for a balanced approach that allows beneficial uses while restricting those that substitute for learning.

4.4 Beliefs about Generative AI adoption

Students' beliefs about their peers' AI Generative usage may influence their own adoption decisions through, for example, social norms or competitive pressure to avoid falling behind. To measure these beliefs, we asked students to estimate what fraction of their peers use Generative AI for different purposes and in different policy environments. Figure 8 presents the distribution of these beliefs. Panels A-C show students' estimates of peer AI usage for schoolwork, leisure, and any purpose respectively. Panels D-F show students' beliefs about AI usage under three policy environments: no class policy, class allows AI, and class disallows AI.

On average, students believe that 67.1 percent of their peers regularly use Generative AI for schoolwork, 37.1 percent for leisure, and 72.0 percent for any purpose. The actual usage rate from our survey is 81.3 percent for schoolwork, suggesting that students systematically underestimate their peers' academic AI use. Students believe that 64.4 percent of their

peers use AI in classes with no explicit policy, 72.8 percent in classes that allow AI, and 45.8 percent in classes that prohibit AI use. These beliefs align qualitatively with students' self-reported behavior under different policies, though the magnitudes differ (Appendix Figure A3). For instance, while students believe 45.8 percent of their peers use AI in classes that prohibit it, only 31.5 percent report they themselves would be likely to do so.[8]

Interestingly, students who believe their peers use AI more extensively are also more likely to use it themselves. Appendix Figure A4 shows a strong positive correlation between beliefs about peer usage and actual usage rates across different student groups. Still, most groups fall above the 45-degree line, indicating that actual usage exceeds believed usage. This figure also shows substantial heterogeneity in beliefs across student characteristics (see also Appendix Table A5). Black students consistently report the highest estimates of peer AI usage, believing that 72.8 percent of peers use AI for any purpose—7.6 percentage points higher than white students' estimates. Students with below-median GPAs and Mathematics/Computer Science majors tend to report higher estimates than their counterparts, while Arts and Environmental Studies majors report the lowest estimates.

5 Conclusion

This paper presents the first systematic evidence on Generative AI adoption at a highly selective U.S. college. Using novel survey data from Middlebury College, we document key findings about how students engage with AI technology: strikingly high and rapid adoption, substantial gaps in adoption across student characteristics, primary usage focused on learning support rather than content creation; significant influence of institutional policies on usage despite gaps in policy awareness, and systematic underestimation of peer AI usage that correlates strongly with students' own adoption decisions.

Our findings have important implications for higher education policy and practice. First, the rapid and widespread adoption of AI tools suggests that categorical bans on AI usage have unintended negative consequences. Many students, particularly those with lower GPAs, use AI primarily as a learning aid—to understand complex concepts, process dense academic readings, and receive immediate feedback on their work. Prohibiting AI use could therefore disproportionately disadvantage the students who benefit most from these

[8]Interestingly, students believe that disallowing Generative AI in classes has a lower deterrent impact than suggested by self-reported behavior. Based on students' beliefs, disallowing AI reduces usage by 18.7 percentage points (from 64.5 percent to 45.8 percent), whereas based on self-reported behavior, it reduces usage by 37.8 percentage points (from 69.3 percent to 31.5 percent).

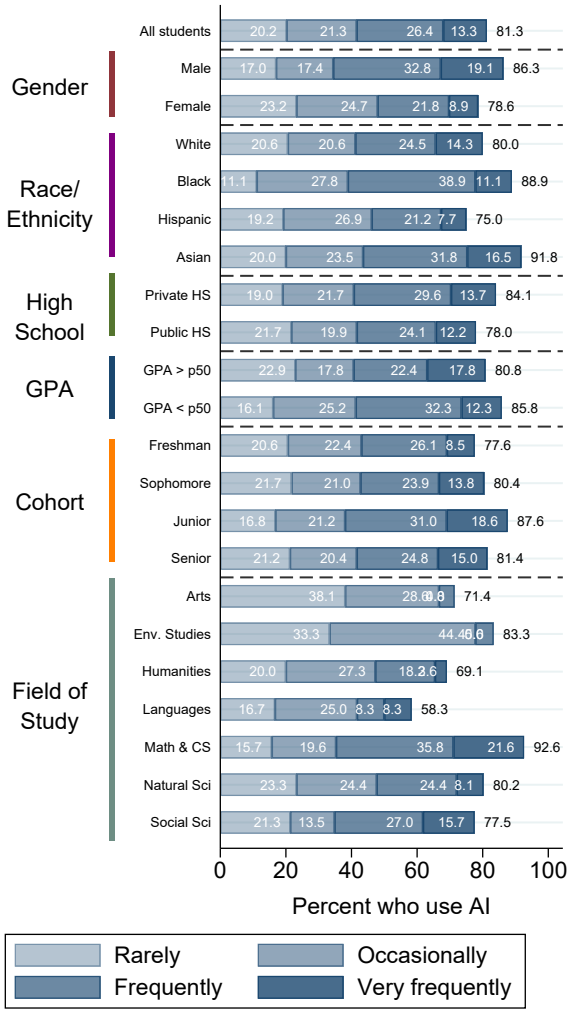
academic support features. Instead, our evidence points toward policies that distinguish between different types of AI use—encouraging applications that enhance learning while restricting those that substitute for it.

Second, the substantial gaps in students' understanding of AI policies highlight the need for clearer guidelines and better training in appropriate AI use. These gaps in policy awareness create risks—students may inadvertently violate academic integrity standards or miss opportunities to use AI tools that could aid their learning. Our open-ended survey responses reveal strong student demand for workshops on effective AI integration and clear examples of acceptable use cases. Students emphasize that they need guidance not just on what is prohibited, but on how to leverage AI to enhance rather than substitute for learning. Given that AI proficiency will likely be valuable in students' future careers, colleges should view AI literacy as an essential skill to develop rather than a challenge to contain.

Looking forward, our results raise important questions for future research. How does AI usage affect actual learning outcomes and academic performance? Do different patterns of AI use—for example, focusing on explanatory versus generative tasks—lead to different educational outcomes? How should faculty modify their teaching and assessment practices in response to widespread AI adoption? As AI technology continues to evolve rapidly, answering these questions will be crucial for understanding how to harness its potential while preserving the core aims of higher education.

Figures and Tables

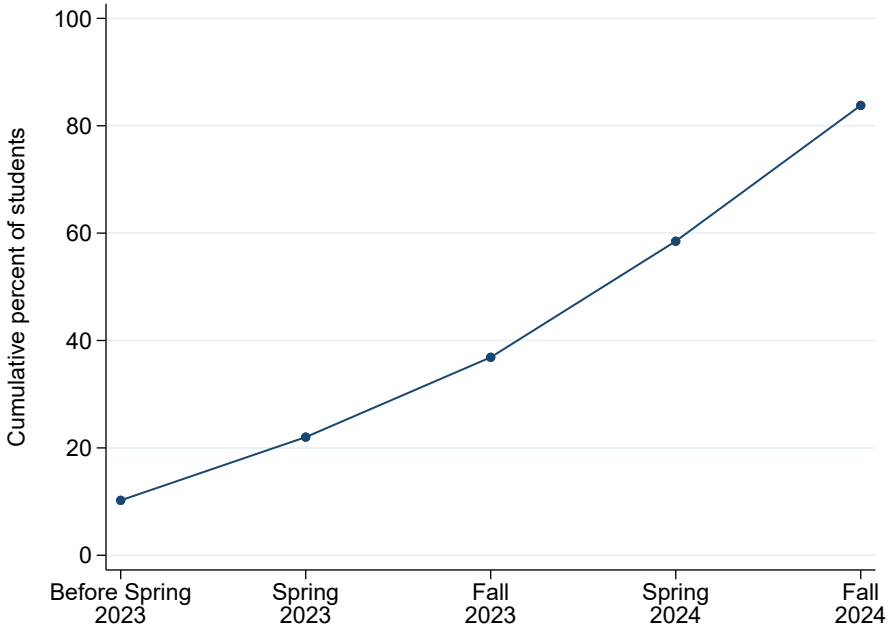
Figure 1: The Adoption of Generative AI among Middlebury College Students



Notes: This figure shows the fraction of students who report using AI during the academic semester, categorized by demographic characteristics, high school type, academic cohort, GPA, and field of study. Usage frequency is divided into four levels: "Rarely" (a few times a semester), "Occasionally" (a few times a month), "Frequently" (a few times a week), and "Very Frequently" (daily or almost daily).

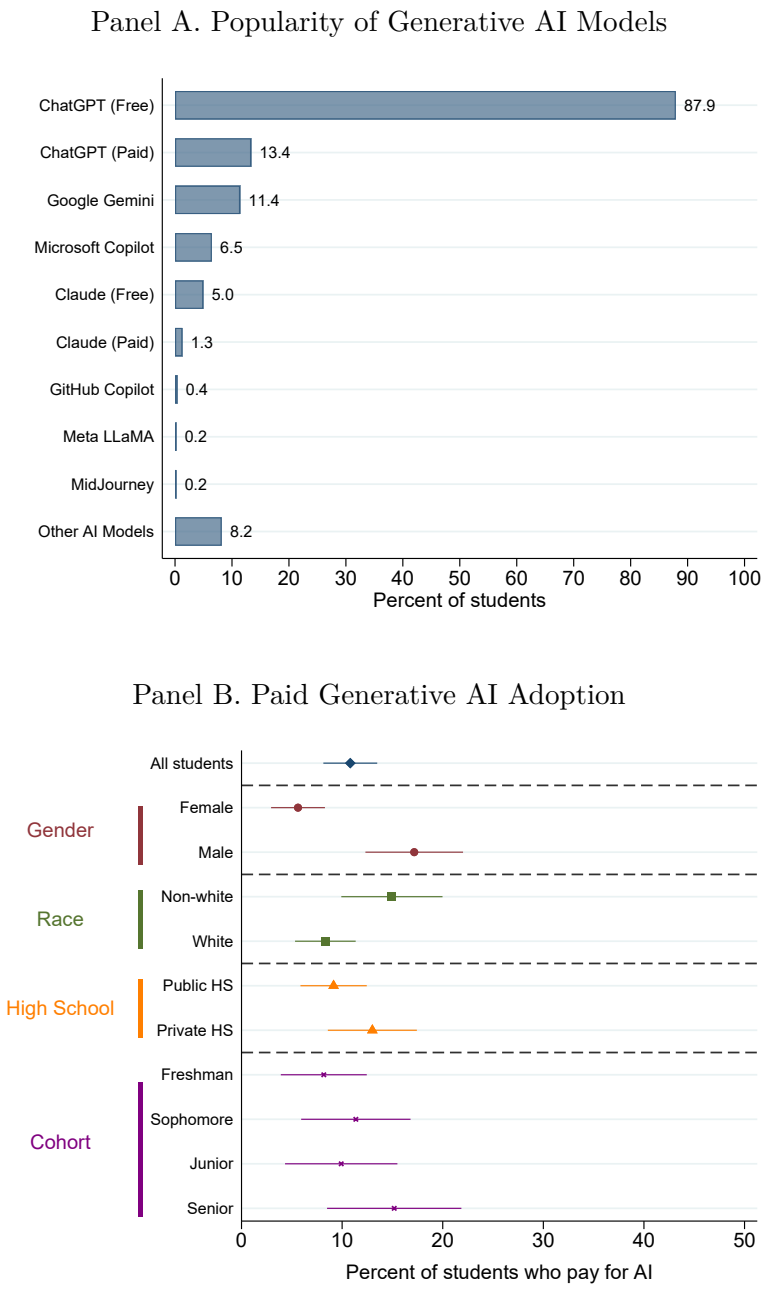
The category "All students" provides the baseline usage rate for the full sample ($N = 534$). Gender categories are based on self-identification, with non-binary responses excluded due to a small sample size. "Private HS" refers to students who attended private high schools, while "Public HS" encompasses all non-private institutions. "Cohort" denotes the student's academic year, ranging from first-year ("Freshman") to fourth-year ("Senior"). GPA categories ("Above p50" and "Below p50") split students into groups above or below the median GPA, as self-reported on a 4.0 scale. See Appendix B.1 for the classification of majors into fields of study.

Figure 2: The Evolution of Generative AI Adoption among Middlebury College Students



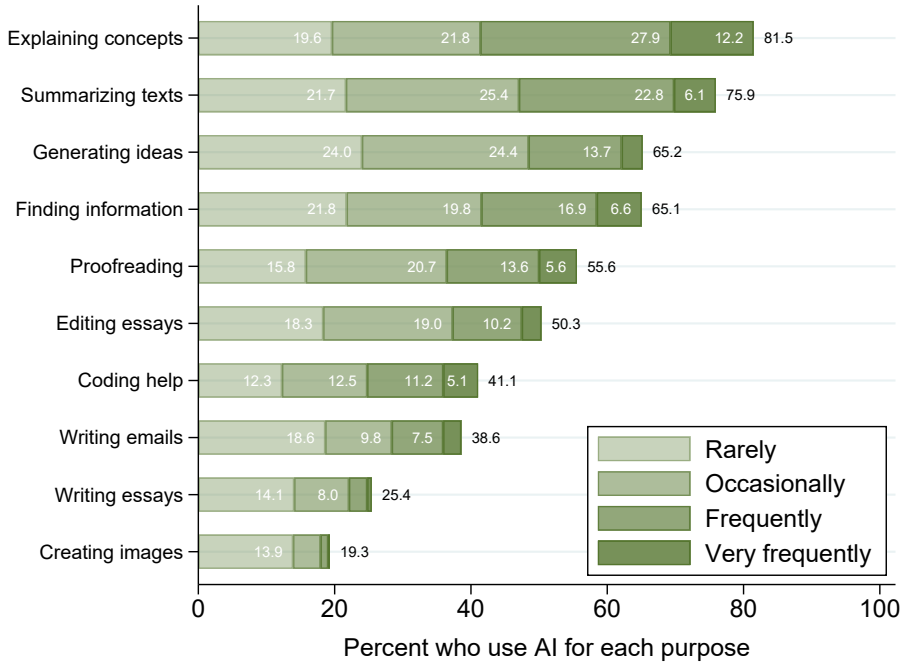
Notes: This figure shows the cumulative percentage of students who reported using AI tools for academic purposes over time, starting before Spring 2023 through Fall 2024, when the survey was conducted. The horizontal axis represents semesters, while the vertical axis represents the cumulative adoption rate.

Figure 3: Adoption of Generative AI Models Among Students



Notes: This figure shows patterns of AI adoption among survey respondents. Panel A displays the adoption rates of various AI tools as of Fall 2024. The horizontal axis shows the percentage of students who reported using each tool, and the vertical axis lists the tools in descending order of adoption rates. Panel B shows the percentage of students who pay for AI tools (through any platform) across different demographic groups, with horizontal lines representing 95 percent confidence intervals.

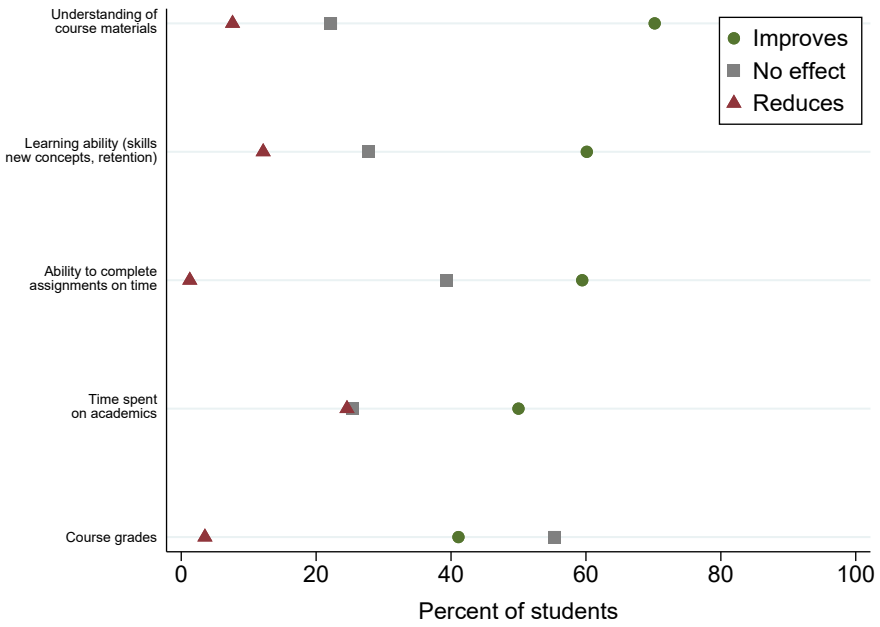
Figure 4: Academic Uses of Generative AI



Notes: This figure shows the percentage of students who use generative AI for different academic purposes. For each purpose, usage frequency is divided into four levels: "Rarely" (a few times a semester), "Occasionally" (a few times a month), "Frequently" (a few times a week), and "Very Frequently" (daily or almost daily). The number at the end of each bar represents the total percentage of students who use AI for that purpose at any frequency.

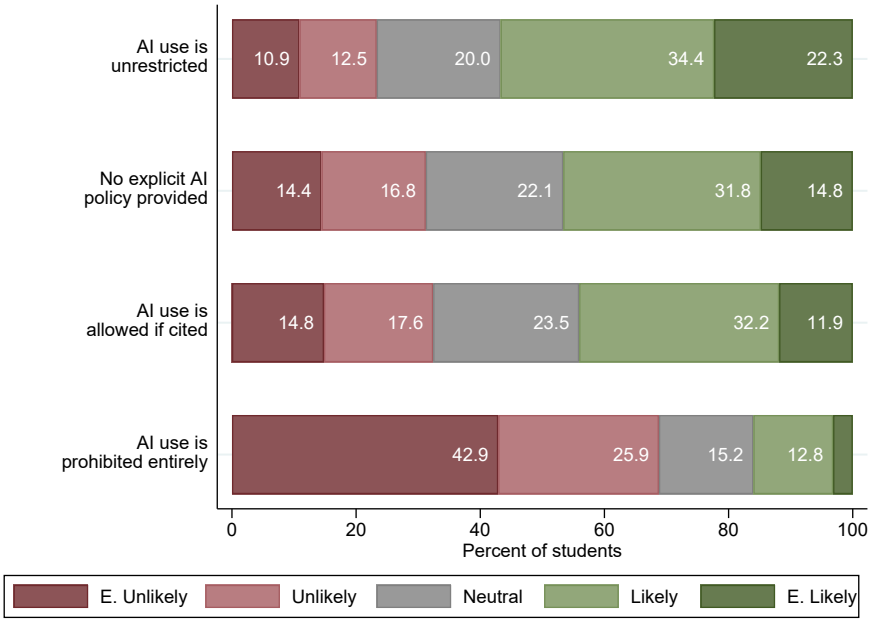
Tasks are ordered by total usage, from highest to lowest. Results are based on responses to the question: "For academic purposes, which of the following tasks do you typically use Generative AI for?" Sample includes all students who reported using AI during the academic semester.

Figure 5: Student Perceptions of AI's Impact on Academic Performance



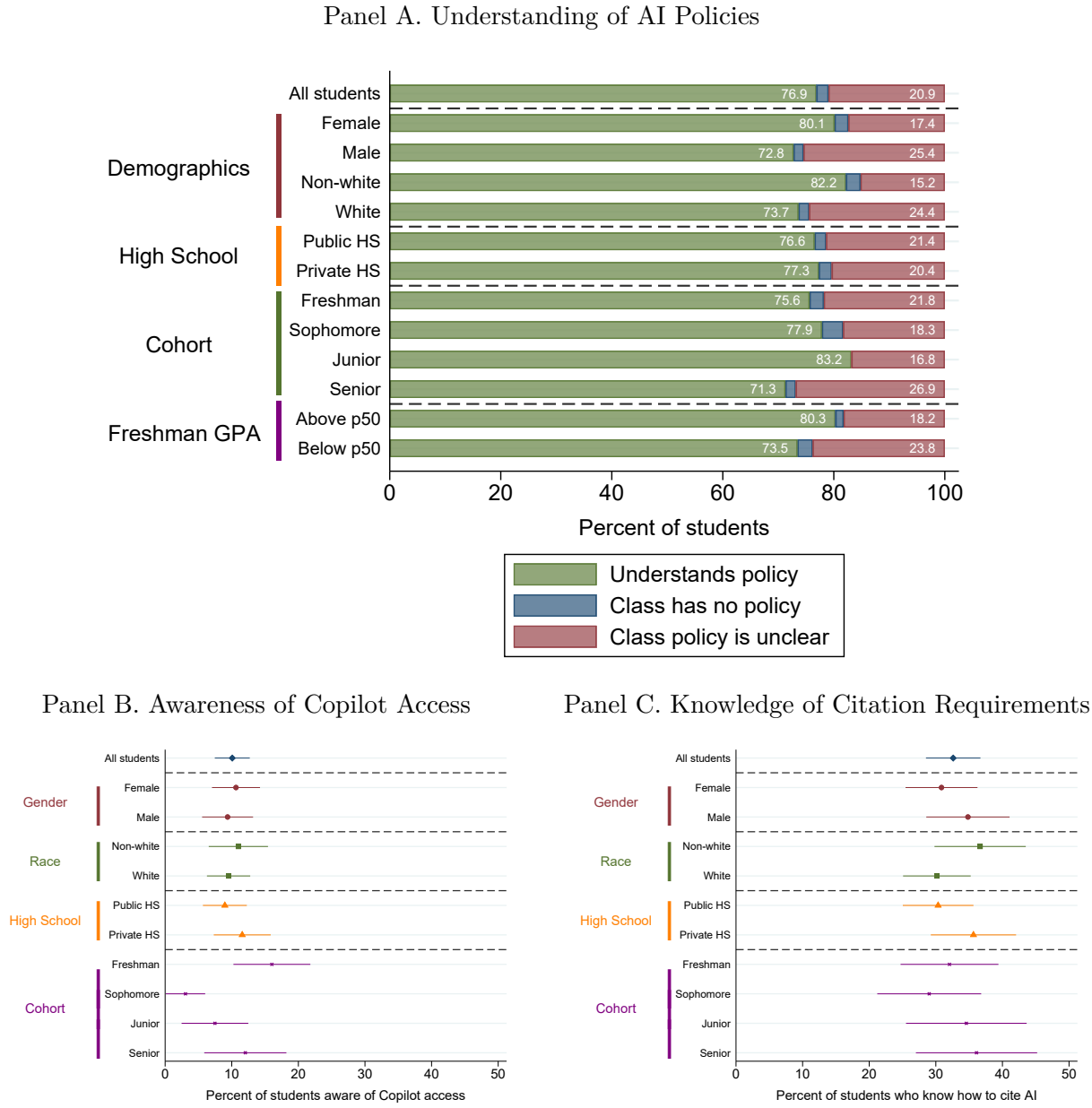
Notes: This figure shows the percentage of students who believe AI improves, reduces, or has no effect on different aspects of their academic experience. For each outcome, responses are categorized into three groups: "Improves" combines "significantly improves" and "somewhat improves" responses, "Reduces" combines "significantly reduces" and "somewhat reduces" responses, and "No effect" represents neutral responses. Sample includes all students who report using AI during the academic semester. "Don't know" responses are excluded.

Figure 6: Student Likelihood of Using Generative AI under Different Policies



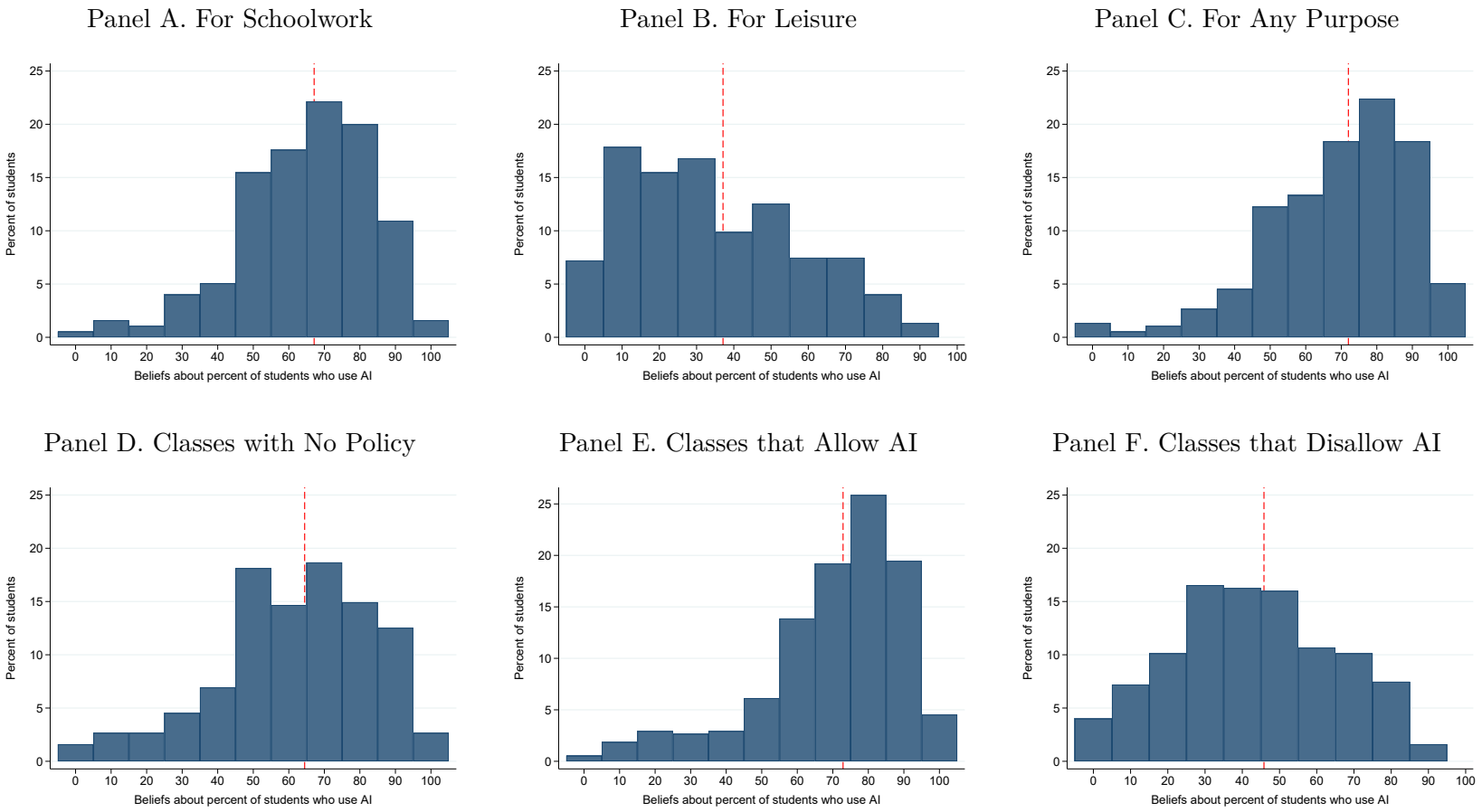
Notes: This figure shows the percentage of students who report different likelihoods of using AI under various policy scenarios. For each policy, responses are categorized on a five-point scale from "Extremely unlikely to use AI" to "Extremely likely to use AI." The sample includes all survey respondents. The question asked was: "How likely are you to use Generative AI in a class with each of the following AI policies?"

Figure 7: Understanding of Generative AI Policies and Resources



Notes: This figure shows students' understanding of institutional AI policies and resources. Panel A displays the percentage of students who report understanding AI policies in their classes, those who report having no explicit policy, and those who find policies unclear, broken down by demographic characteristics. Panel B shows the percentage of students who are aware of their free access to Microsoft Copilot through Middlebury College. Panel C presents the percentage of students who report knowing how to properly cite AI use in their academic work when required. For Panels B and C, horizontal lines represent 95 percent confidence intervals. Sample includes all survey respondents.

Figure 8: Student Beliefs about Generative AI Usage at Middlebury College



Notes: This figure shows the distribution of students' beliefs about Generative AI usage among their peers at Middlebury College. Panels A-C display students' estimates of the percentage of their peers who regularly use AI for schoolwork, leisure activities, and any purpose, respectively. Panels D-F show students' beliefs about AI usage in classes with different AI policies: those without an explicit policy (Panel D), those that allow AI use (Panel E), and those that prohibit AI use (Panel F). Each panel shows a histogram with bins of width ten percentage points (e.g., responses between 1-10 fall in the 10 bin, 11-20 in the 20 bin, etc.). The red dashed line indicates the mean response. Sample excludes respondents with missing values or who selected the default response for all six categories (which equals zero).

Table 1: Summary Statistics of Survey Participants

	Mean (1)	SD (2)	N (3)
Panel A. Demographics			
Male	0.451	0.498	534
Female	0.507	0.500	534
White	0.627	0.484	534
Black	0.034	0.181	534
Hispanic	0.097	0.297	534
Asian	0.159	0.366	534
Private high school	0.423	0.495	534
Public high school	0.536	0.499	534
Panel B. Academic Characteristics			
First-year GPA	3.737	0.305	369
Hours spent on academics per week	18.102	10.006	534
Freshman	0.310	0.463	533
Sophomore	0.259	0.438	533
Junior	0.212	0.409	533
Senior	0.212	0.409	533
Panel C. Field of Study			
Arts	0.043	0.204	485
Environmental Studies	0.037	0.189	485
Humanities	0.113	0.317	485
Languages	0.025	0.155	485
Mathematics & Computer Science	0.421	0.494	485
Natural Sciences	0.177	0.382	485
Social Sciences	0.184	0.387	485

Notes: This table presents summary statistics from our survey of college students' AI usage. Panel A reports demographic characteristics, including the proportion of participants identifying as male, female, white, Black, Hispanic, Asian, or who attended a private or public high school. Panel B provides academic characteristics, such as first-year GPA (self-reported on a 4.0 scale), average weekly hours spent on academics, and academic year distribution (Freshman, Sophomore, Junior, and Senior). Panel C summarizes the distribution of participants across different fields of study, including the intended primary major for students who have not yet declared. Major groups are mutually exclusive. The columns show the mean, standard deviation (SD), and the number of observations (N) for each variable.

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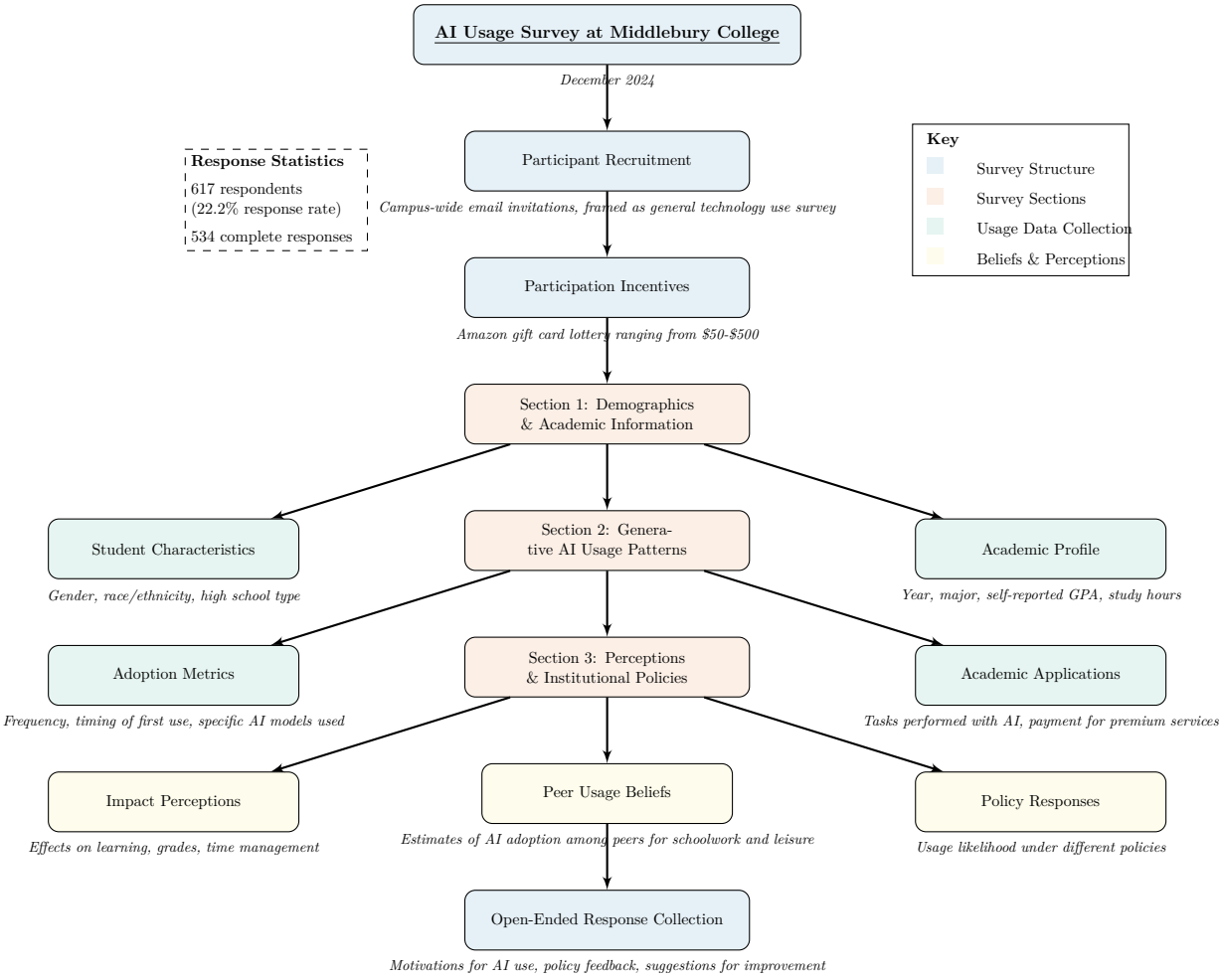
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Appendix

A Appendix Figures and Tables

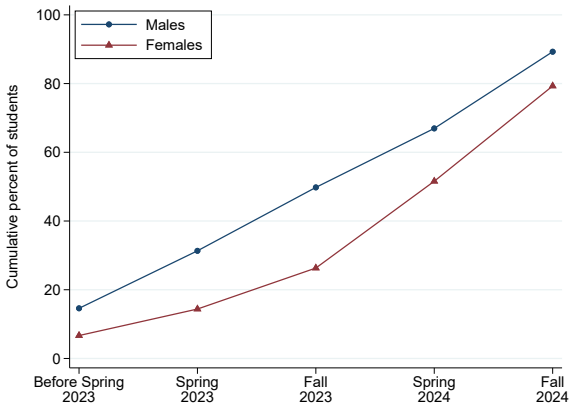
Figure A1: AI Usage Survey Design Overview



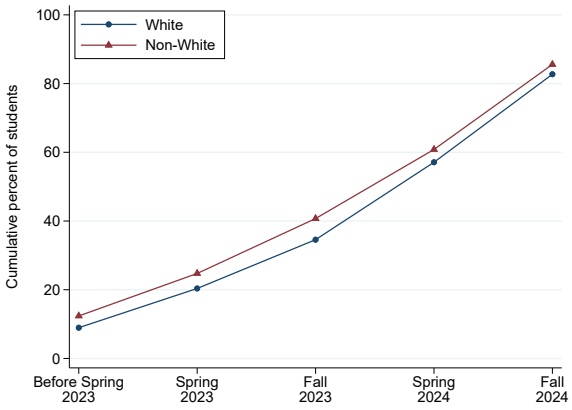
Note: This figure illustrates the structure of the AI usage survey conducted at Middlebury College in December 2024. The survey collected information across three main sections: (1) demographic and academic background, (2) patterns of generative AI usage including adoption timing, frequency, and specific applications, and (3) perceptions of AI's impact on learning and responses to institutional policies. To minimize selection bias, the survey was framed broadly as research on technology use rather than specifically about AI tools, and substantial participation incentives were provided.

Figure A2: Cumulative Generative AI Use by Student Characteristic

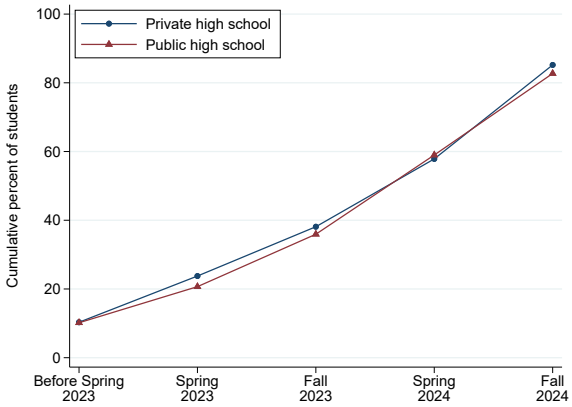
Panel A. By Gender



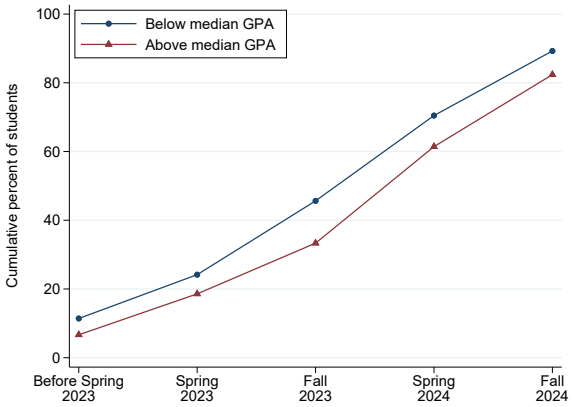
Panel B. By Race



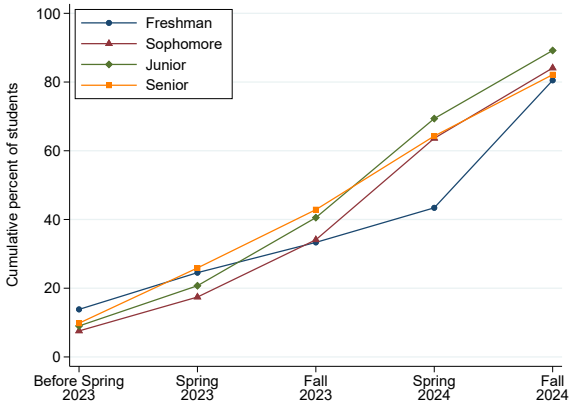
Panel C. By High School Type



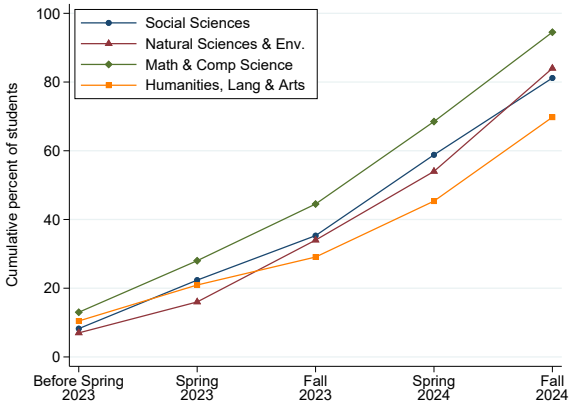
Panel D. By Freshman Year GPA



Panel E. By Cohort

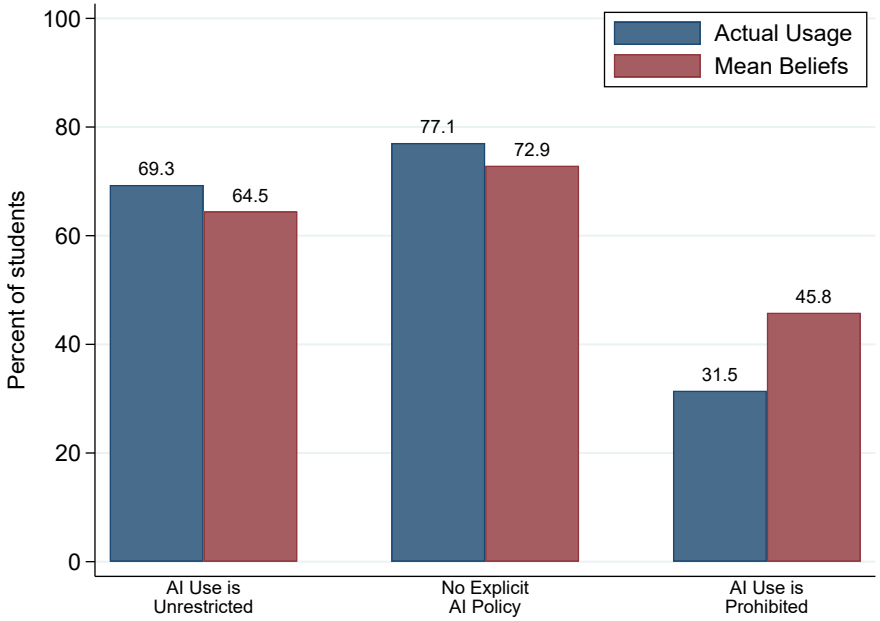


Panel F. By Field of Study



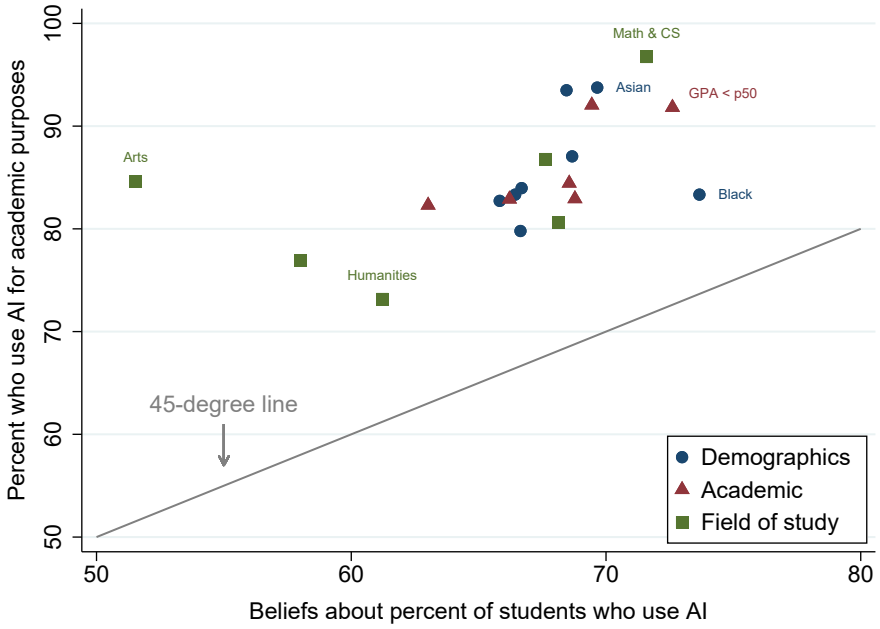
Notes: This figure presents cumulative AI use based on different student characteristics. Each panel displays the cumulative distribution of AI use based on a specific characteristic: gender, race, school type, GPA, cohort, or field of study. The cumulative percentage of students is plotted against usage categories. The legends and colors correspond to subgroups within each demographic variable.

Figure A3: Student Beliefs about AI Usage vs. Actual Usage under Different Policies



Notes: This figure compares students' beliefs about AI usage with actual usage rates under different AI policies. For each policy type, blue bars show the percentage of students who report being "Neutral," "Likely," or "Very Likely" to use AI, while red bars show students' mean beliefs about what percentage of their peers use AI in classes with that policy. The sample includes all survey respondents for both actual usage and beliefs measures. "AI Use is Unrestricted" refers to classes with no restrictions on AI use, "No Explicit AI Policy" refers to classes without a stated policy, and "AI Use is Prohibited" refers to classes that ban AI use entirely.

Figure A4: Relationship Between Beliefs About and Actual Generative AI Usage



Notes: This figure shows the relationship between students' beliefs about AI usage among their peers and actual AI usage rates across different demographic groups. Each point represents a different group of students (by demographics, academic characteristics, or field of study). The y-axis shows the percentage of students in each group who report using AI for academic purposes. The x-axis shows the mean belief within each group about what percentage of Middlebury students use AI. The dashed line shows the linear fit. Sample includes all survey respondents with at least ten observations per group. Students' beliefs about AI usage are positively correlated with actual usage patterns, suggesting that students have relatively accurate perceptions of AI adoption among their peers.

Table A1: Generative AI Usage Frequency by Student Characteristics

		By Usage Frequency			
	Any use (1)	Rarely (2)	Occasionally (3)	Frequently (4)	Very Frequently (5)
Panel A. Demographics					
Male	86.3	17.0	17.4	32.8	19.1
Female	78.6	23.2	24.7	21.8	8.9
White	80.0	20.6	20.6	24.5	14.3
Black	88.9	11.1	27.8	38.9	11.1
Hispanic	75.0	19.2	26.9	21.2	7.7
Asian	91.8	20.0	23.5	31.8	16.5
Private HS	84.1	19.0	21.7	29.6	13.7
Public HS	78.0	21.7	19.9	24.1	12.2
Panel B. Academic Characteristics					
GPA $>$ p50	80.8	22.9	17.8	22.4	17.8
GPA $<$ p50	85.8	16.1	25.2	32.3	12.3
Freshman	77.6	20.6	22.4	26.1	8.5
Sophomore	80.4	21.7	21.0	23.9	13.8
Junior	87.6	16.8	21.2	31.0	18.6
Senior	81.4	21.2	20.4	24.8	15.0
Panel C. Field of Study					
Arts	71.4	38.1	28.6	4.8	0.0
Env. Studies	83.3	33.3	44.4	5.6	0.0
Humanities	69.1	20.0	27.3	18.2	3.6
Languages	58.3	16.7	25.0	8.3	8.3
Math & CS	92.6	15.7	19.6	35.8	21.6
Natural Sciences	80.2	23.3	24.4	24.4	8.1
Social Sciences	77.5	21.3	13.5	27.0	15.7

Notes: This table presents the percentage of students in each demographic group who report using AI with different frequencies during the academic semester. Each cell shows the percentage of students within that group. Column (1) shows the total percentage of students in each group who use AI at any frequency. Columns (2)-(5) represent different usage frequencies: rarely (1-2 times per semester), occasionally (monthly), frequently (weekly), and very frequently (multiple times per week). Panel A reports percentages by demographic characteristics. Panel B shows percentages by academic characteristics. Panel C presents percentages by field of study.

Table A2: Percentage who Report Using AI "Frequently" or "Very Frequently" by Purpose and Student Characteristics

	Finding Info (1)	Explaining Concepts (2)	Summarizing Text (3)	Generating Ideas (4)	Proof-reading (5)	Essay Editing (6)	Essay Writing (7)	Coding Help (8)	Email Writing (9)	Image Creation (10)
Panel A. Demographics										
Male	30.8	45.9	37.0	21.0	20.3	15.0	4.3	16.4	11.7	1.4
Female	17.8	35.6	21.8	13.8	18.9	11.2	2.7	16.9	8.6	1.4
White	19.3	38.4	26.9	17.1	15.7	11.3	2.5	16.0	6.8	1.1
Black	50.0	52.9	41.2	25.0	35.3	5.9	0.0	11.8	11.8	0.0
Hispanic	28.9	47.4	30.8	23.1	28.9	15.8	7.9	13.2	15.8	2.8
Asian	30.9	42.0	28.8	12.7	23.8	20.3	5.0	19.2	13.9	1.3
Private HS	29.4	42.9	33.2	13.9	19.5	13.4	3.0	13.7	11.5	1.0
Public HS	19.1	36.2	25.2	18.9	19.6	13.4	3.5	19.5	8.3	1.3
Panel B. Academic Characteristics										
GPA > p50	27.0	36.7	27.8	14.7	17.6	11.3	4.0	19.4	8.6	2.9
GPA < p50	20.4	47.1	34.1	19.7	25.5	18.0	2.9	21.3	13.7	0.7
Freshman	22.1	37.4	25.2	16.4	14.6	10.2	2.9	7.3	8.7	0.0
Sophomore	21.4	36.4	25.4	13.8	17.9	11.1	1.7	12.3	8.6	0.9
Junior	26.5	48.5	33.7	20.0	27.3	14.7	2.0	18.2	11.9	2.0
Senior	25.0	38.9	33.7	18.1	19.4	18.3	7.6	31.9	13.0	3.3
Panel C. Field of Study										
Arts	0.0	16.7	5.6	0.0	11.8	0.0	0.0	17.6	0.0	0.0
Env. Studies	6.2	6.2	6.2	6.2	6.2	6.2	0.0	0.0	0.0	0.0
Humanities	17.1	22.5	25.0	7.5	7.7	5.1	5.1	7.9	7.9	0.0
Languages	12.5	25.0	12.5	0.0	12.5	12.5	0.0	0.0	0.0	12.5
Math & CS	31.1	50.0	33.7	22.6	19.8	14.4	5.4	23.4	11.2	0.0
Natural Sciences	13.9	35.1	20.5	12.5	19.4	9.6	1.4	13.9	5.5	2.8
Social Sciences	30.7	46.7	35.5	20.0	28.0	21.1	1.4	12.3	18.4	4.1

Notes: This table presents the percentage of students in each demographic group who report using AI "frequently" or "very frequently" for different purposes. Each cell shows the percentage of students within that group. For example, column (1) shows the percentage of students in each group who frequently or very frequently use AI for finding information. Columns represent different AI usage purposes: finding information, explaining concepts, summarizing text, generating ideas, proofreading, essay editing, essay writing, coding help, email writing, and image creation. Panel A reports percentages by demographic characteristics. Panel B shows percentages by academic characteristics. Panel C presents percentages by field of study.

Table A3: Percentage who Report AI Improves Learning Experience by Dimension and Student Characteristics

	Understanding Course Materials (1)	Learning Ability (2)	Assignment Completion (3)	Time Spent on Academics (4)	Course Grades (5)
Panel A. Demographics					
Male	75.3	66.8	50.5	69.2	51.2
Female	67.9	56.2	48.8	51.5	32.5
White	66.8	55.4	47.3	56.3	40.0
Black	93.3	86.7	50.0	56.2	64.3
Hispanic	71.7	69.6	55.3	63.0	45.2
Asian	79.5	67.9	50.6	66.2	37.3
Private HS	71.1	64.2	50.7	61.6	41.9
Public HS	67.9	54.8	48.2	56.5	39.5
Panel B. Academic Characteristics					
GPA > p50	64.7	53.8	42.2	54.1	36.6
GPA < p50	73.8	69.8	51.1	63.4	48.9
Freshman	73.8	59.0	58.9	62.3	39.4
Sophomore	70.7	63.1	43.0	59.8	44.2
Junior	70.9	65.3	52.0	61.2	50.0
Senior	63.3	53.1	43.4	52.1	30.2
Panel C. Field of Study					
Arts	35.3	35.3	41.2	37.5	35.3
Env. Studies	44.4	27.8	33.3	50.0	18.8
Humanities	53.2	45.7	43.5	37.8	15.9
Languages	44.4	50.0	40.0	40.0	22.2
Math & CS	78.2	70.8	54.2	67.9	53.6
Natural Sciences	78.9	61.8	50.7	58.7	44.0
Social Sciences	62.8	53.8	48.1	59.0	36.4

Notes: This table presents the percentage of students in each demographic group who report that AI "improves" or "significantly improves" different aspects of their academic performance. Each cell shows the percentage of students within that group. For example, column (1) shows the percentage of students in each group who believe AI improves their understanding of course materials. Columns represent different academic outcomes: understanding of course materials, learning ability (skills, new concepts, retention), ability to complete assignments on time, time spent on academics, and course grades. Panel A reports percentages by demographic characteristics. Panel B shows percentages by academic characteristics. Panel C presents percentages by field of study.

Table A4: Percentage who Report Being Likely to Use AI by Policy Type and Student Characteristics

	AI Use is Unrestricted (1)	No Explicit AI Policy (2)	AI Use is Allowed if Cited (3)	AI Use is Prohibited (4)	Difference: Unrestricted minus Prohibited (5)
Panel A. Demographics					
Male	83.0	77.2	72.8	42.9	40.2
Female	72.5	63.0	64.5	22.9	49.6
White	75.2	68.3	67.0	30.5	44.8
Black	87.5	75.0	68.8	31.2	56.2
Hispanic	79.6	63.3	73.5	34.7	44.9
Asian	84.5	77.4	70.2	32.1	52.4
Private HS	80.6	72.7	69.4	31.5	49.1
Public HS	73.3	64.8	65.2	31.5	41.9
Panel B. Academic Characteristics					
GPA $>$ p50	74.4	64.0	61.6	30.0	44.3
GPA $<$ p50	82.3	80.3	76.9	34.7	47.6
Freshman	74.4	64.1	66.7	29.5	44.9
Sophomore	76.3	69.5	67.9	29.8	46.6
Junior	81.3	74.8	69.2	35.5	45.8
Senior	75.0	67.6	65.7	31.5	43.5
Panel C. Field of Study					
Arts	61.1	38.9	38.9	11.1	50.0
Env. Studies	77.8	55.6	50.0	27.8	50.0
Humanities	58.5	49.1	47.2	13.2	45.3
Languages	50.0	30.0	30.0	10.0	40.0
Math & CS	87.9	81.9	79.4	40.7	47.2
Natural Sciences	76.2	68.8	67.5	18.8	57.5
Social Sciences	71.4	69.0	67.9	38.1	33.3

Notes: This table presents the percentage of students in each demographic group who report being "neutral," "likely" or "very likely" to use AI under different institutional policies. We include the "neutral" category to better match overall usage patterns. Each cell shows the percentage of students within that group. For example, column (1) shows the percentage of students in each group who are likely to use AI when its use is unrestricted. Columns represent different policy scenarios: unrestricted use, no explicit policy, use allowed with citation, and use prohibited entirely. Panel A reports percentages by demographic characteristics. Panel B shows percentages by academic characteristics. Panel C presents percentages by field of study.

Table A5: Student Beliefs about AI Usage Patterns by Student Characteristics

	By Usage Type			By Class Policy		
	For Schoolwork (1)	For Leisure (2)	For Any Purpose (3)	Classes that Allow AI (4)	Classes that Disallow AI (5)	Classes with No Policy (6)
Panel A. Demographics						
Male	56.0	31.1	66.5	65.0	43.1	60.1
Female	54.0	33.3	63.7	64.1	42.2	59.7
White	54.6	31.1	65.2	64.7	41.6	59.4
Black	60.5	51.1	72.8	65.0	55.0	76.2
Hispanic	45.3	25.5	60.6	51.8	37.0	47.8
Asian	58.1	34.8	62.1	68.4	44.2	61.3
Private HS	58.5	33.1	66.7	67.4	43.7	61.1
Public HS	52.2	32.1	62.5	62.0	40.8	58.3
Panel B. Academic Characteristics						
GPA > p50	54.3	33.7	64.1	62.6	41.5	58.3
GPA < p50	59.7	32.6	67.4	67.5	48.0	62.6
Freshman	50.6	30.7	63.0	64.0	37.8	58.5
Sophomore	53.6	30.8	61.5	60.9	39.4	58.9
Junior	60.3	35.1	68.9	67.7	49.8	65.4
Senior	57.1	34.8	67.1	65.6	44.0	56.8
Panel C. Field of Study						
Arts	41.9	29.4	49.9	55.9	29.8	47.4
Env. Studies	46.1	27.4	58.1	52.6	27.8	42.7
Humanities	52.6	34.9	61.3	61.2	38.1	58.2
Languages	57.5	38.1	64.9	58.4	34.7	42.3
Math & CS	59.7	31.1	67.5	69.4	46.6	63.0
Natural Sciences	49.8	31.5	58.9	60.9	35.8	57.0
Social Sciences	54.8	35.9	69.9	62.6	46.9	61.1

Notes: This table presents average beliefs about AI usage among Middlebury students by demographic characteristics. Each cell shows the mean belief within that group about what percentage of students use AI. For example, column (1) shows what percentage of Middlebury students each group believes uses AI for schoolwork. Columns (1)-(3) represent beliefs about general AI usage: for schoolwork, leisure activities, and any purpose. Columns (4)-(6) represent beliefs about AI usage in different types of classes: those that allow AI use, those that disallow it, and those with no explicit policy. Panel A reports beliefs by demographic characteristics. Panel B shows beliefs by academic characteristics. Panel C presents beliefs by field of study.

B Empirical Appendix

B.1 Field of Study Classifications

This appendix details the classification of majors into broad fields of study used in Figure 1:

- **Mathematics & Computer Science:** Covers majors in Mathematics, Statistics, and Computer Science.
- **Environmental Studies:** Includes majors such as Environmental Science, Environmental Studies, and Conservation Biology.
- **Natural Sciences:** Includes majors related to Biology, Chemistry, Physics, Neuroscience, Molecular Biology and Biochemistry, Earth Sciences, Geology, and Molecular studies.
- **Social Sciences:** Includes majors such as Economics, Geography, Political Science, Sociology, Psychology, Anthropology, International Politics, and International Politics and Economics.
- **Arts:** Includes majors in Art (general and studio art), Architecture, and related artistic disciplines.
- **Humanities:** Includes majors in English, History, Philosophy, Literature, American Studies, Comparative Studies, and Gender, Sexuality, and Feminist Studies.
- **Languages:** Includes majors in Spanish, Chinese, Japanese, French, and other language-related studies.

C Qualitative Evidence on Student Perspectives on AI Use

In this section, we analyze student responses to an open-ended question about their use of generative AI. The survey question asked: "Please describe the factors that have personally influenced your use of Generative AI in your academic work. What initially led you to try it, what has motivated you to use it or caused you to hesitate?" This was an optional question that 48.3 percent of survey respondents answered. Appendix Figure C1 presents a word cloud of the most frequent words in student responses.

To analyze these responses systematically, we classified each response using keywords based on their content. For example, if a student mentioned using AI to save time, we tagged the response with the keyword "time-saver." If a student expressed concerns about AI's impact on learning, we tagged it with "negative learning." Responses could receive multiple keywords if they discussed several themes. Appendix Figure C2 shows the frequency of keywords in our classification. The responses reveal how students use AI tools, what motivates this use, and what causes some to avoid or limit their use.

C.1 How Students use AI

The most common use of AI is as an explanatory tool. Nearly 30 percent of responses mentioned using AI to understand course material. Students frequently ask AI to break down complex concepts from readings and lectures, particularly when they find the material difficult to understand. For example, one student reported: "I can ask AI to explain concepts to me that I have a hard time grasping. [...] I can keep asking 'simplify' or 'break down even more."' Students also use AI to summarize dense academic readings, which they argue helps them manage heavy reading loads.

Students employ AI throughout different stages of the writing process. Some use AI to generate initial drafts that serve as starting points. One student explained: "Helps me get started with a base for most of my essays. It feels easier to edit something already written and make it my own than to write from scratch." Others use AI more narrowly for brainstorming when stuck on specific problems. As one student noted: "I use it if I am feeling stuck to push me to the right direction (whether a mathematical problem or an essay idea)." Many also report using AI as an editing tool to improve grammar, sentence structure, and overall writing flow. This is especially the case for non-native English speakers. As one student explained: "English is not my first language and it frustrates me sometimes that I cannot find the best way to phrase a certain idea and AI is a useful tool

to have to find alternate expressions."

Students frequently mentioned using AI for specific academic tasks. In courses that require coding, students often use AI for debugging code and understanding programming concepts. Students also employ AI for administrative tasks like formatting citations and drafting routine emails. Finally, many students use AI as an enhanced search engine. One student reported: "It has significantly reduced the time it takes to conduct research on new topics and ideas, and helps me by giving me a thorough selection of sources to use for projects of any kind."

C.2 Why Students adopt AI

Time savings was the most commonly cited reason for using AI. Nearly 30 percent of responses mentioned using AI to complete work more efficiently. Students often viewed AI as a way to manage demanding course loads. Many students particularly embrace AI assistance for tasks viewed as mechanical or administrative. A student noted they use AI for "Writing emails quick and creating resume/ cover letter templates." But AI assistance goes beyond grunt work. Some students use it to "spend less time doing assignments and homework." This is particularly true if students don't view the work as central to their academic experience. As one student explained: "when I come across work I deem as ineffective, I want to spend as little time as possible doing it."

Having an on-demand tutor for academic support was another key motivation. One-quarter of responses described using AI as an "explainer" when other resources were unavailable or inconvenient. As one student noted, "I use it as a last resort (if there are no office hours, after looking up videos, etc.) if I need extra help. I'd like to think that the way I use it is similar to going to office hours or TA hours."

Peer influence also drove AI adoption. Some students reported feeling pressure to use AI to remain competitive with their classmates. One student explained: "I noticed others use it, are getting better grades than me, and they say they learn better with the help of AI, so I gave it a try." Others worried about being at a competitive disadvantage: "Other people were using it and told me about it. I felt like I would be at a disadvantage if I wasn't also using it."

C.3 Concerns and Limitations

Students expressed several concerns about AI use in academic work. The most frequent worry was about negative impacts on learning. One student who initially used AI exten-

sively reported: "In the past, I have simply plugged and chugged homework assignments into ChatGPT and submitted it. Those assignments feedback from teachers was positive and I was getting good grades, but I definitely felt that my own learning outcomes to be significantly worse." Other students viewed AI use as fundamentally incompatible with their educational goals. As one humanities student explained: "my task is as a humanities student is to think, not calculate; why should I let AI do the thinking for me? It would defeat the purpose of pursuing my education."

Many students described ethical concerns about AI use. Responses suggested uncertainty about appropriate boundaries. One student noted: "I never use it to explicitly write something because that feels like overt cheating, but sometimes I hesitate when it completely solves Econ problems. I understand how it does it, and it helps me to learn, but it still sometimes feels a little morally gray." Another expressed similar ambivalence: "I tend to only use it when [it] will save me time in a moral way."

Students also emphasized the importance of maintaining ownership of their work. Many expressed pride in producing original work and hesitation about diluting that ownership through AI use. As one student explained: "I don't have interest in using Generative AI for my academic work because I want my work to reflect my own ideas." Another noted: "It usually would not even occur to me to turn to AI to substitute writing because I want to take credit for my work, and using AI seems to diminish that."

Technical limitations deterred some students from using AI tools. Students reported concerns about inaccurate outputs ("hallucinations") and poor output quality, particularly for creative writing or complex analytical tasks. For example, one student noted that "In my poetry class we were instructed to use it to come up with poems and they were awful, so that kinda turned me away from using it to do my work for me."

C.4 Discussion

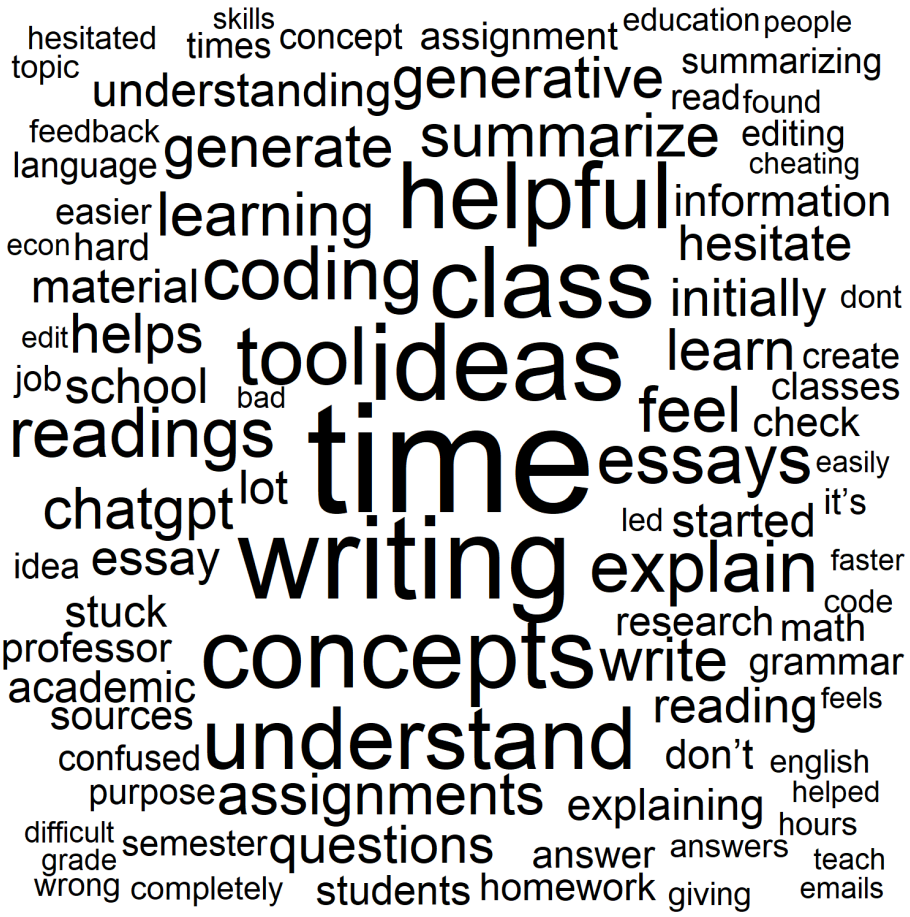
We conclude with two overarching themes that emerged from the responses.

First, students vary substantially in how they incorporate AI into their academic lives. Crucially, this heterogeneity largely depends on what students perceive as "appropriate" uses of AI. For activities that they perceive as core to their academic journey—like writing essays or solving problems—many students hesitate to use AI. A student articulated this clearly: "Most of my work is writing or reading. If I'm not doing the writing, what is the purpose of me taking the class?" Yet, students draw different boundaries between central tasks and grunt work. Some use AI extensively, viewing their role as akin to a manager that

provides high-level direction while AI handles implementation. Others restrict AI use to specific tasks like brainstorming, editing, or drafting emails. Still others avoid AI entirely for academic work, often for ethical reasons. Even among AI users, adoption patterns reflect individual trade-offs between time savings, learning goals, and academic integrity concerns.

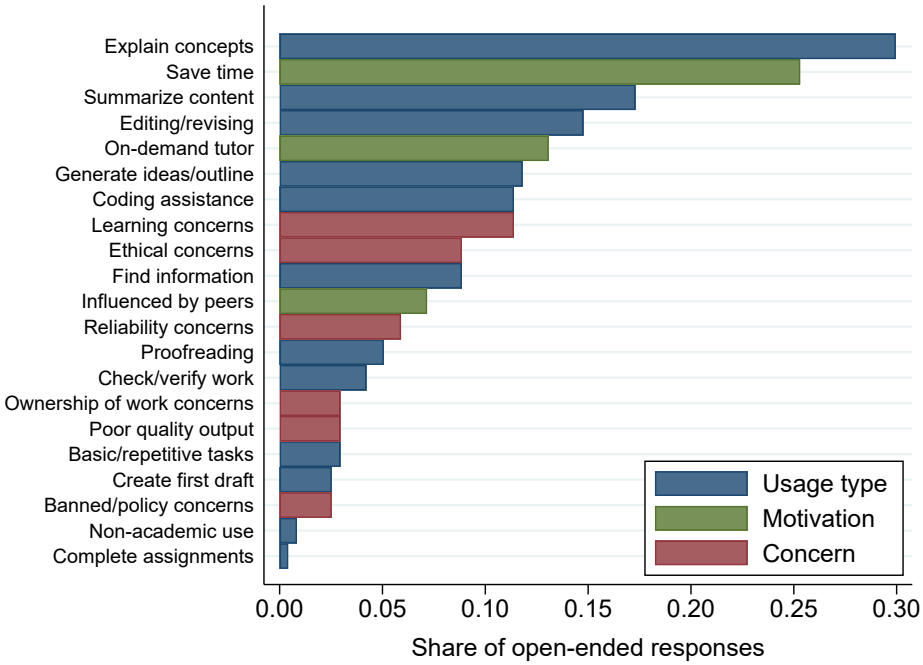
Second, there appears to be a fundamental tension between efficiency and learning. The time-saving benefits are easy to observe, quantifiable, and tangible. But these time savings are unlikely to be a free lunch. Some benefits may come at the cost of spending less time with material that requires deeper engagement to digest. As one student noted: "There may be a negative effect in that it eliminates much of the 'struggle' in learning." Yet, having an on-demand tutor that explains concepts in relatable ways can also improve learning. As one student explained: "It can explain concepts to me in a way that is tailored to my learning style." This suggests that the impact of AI use on learning outcomes depends not on whether students use AI—almost all do, to some extent—but rather on how they employ these tools.

Figure C1: Word Cloud of Student Motivations for Generative AI Use



Notes: Word cloud displaying words that appear at least five times in 147 student responses after removing common English stop words and the word "AI". Text size is proportional to word frequency. The visualization is based on responses to the question: "Please describe the factors that have personally influenced your use of Generative AI in your academic work. What initially led you to try it, what has motivated you to use it or caused you to hesitate?'

Figure C2: Frequency of Keywords in Student Motivations for AI Use



Notes: The figure shows the share of open-ended responses that mentioned different themes related to AI use. The responses come from the question "Please describe the factors that have personally influenced your use of Generative AI in your academic work. What initially led you to try it, what has motivated you to use it or caused you to hesitate?" Color coding indicates the category of each theme. Usage type refers to how students use AI tools. Motivation captures what drove students to try AI. Concerns include mentions of course policies and academic integrity, individual reservations about AI use, worries about AI's impact on education, and AI's technical limitations.

D Qualitative Evidence on Student Views of AI Policies

In this section, we analyze student responses to an open-ended question about Middlebury's AI policies. The survey asked: "Do you have any specific feedback or suggestions about Middlebury's Generative AI policies, resources, or support services?" Appendix Figure D1 presents a word cloud of the most frequent words in student responses. To analyze these responses systematically, we classified each response using keywords based on their content. Appendix Figure D2 shows the frequency of keywords in our classification.

D.1 Polarized Views on AI Policy Approaches

Students expressed markedly different views about appropriate AI policies, revealing fundamental disagreement about the path forward. Some strongly advocated for embracing AI technology. As one student argued, "The tool is there, there is supply and there is demand. Don't fight another war on drugs. Don't live in a fake reality". Others called for significant restrictions, arguing that "the use of Generative AI is dishonest and corrosive" and that it "prohibits these organic processes and divorces students from true learning".

However, the most common position advocated for a balanced approach that would allow beneficial uses while restricting harmful ones. Students distinguished between uses that enhance learning (like concept explanation) and those that substitute for learning (like generating entire essays). One student articulated this nuanced view particularly well: "AI also can really be helpful at explaining a textbook problem that doesn't make sense, or guiding slightly with homework, or creating study materials, or editing/tightening up your prose. All of those things are good, and universities should figure out how to maximize AI use for those reasons and to minimize students just feeding their problem sets into ChatGPT"

A recurring theme was the futility of blanket bans. Many students emphasized that prohibition would be ineffective, with one noting "I don't think anyone really cares what the policy of any given class is. If professors want people to not use it, they need to structure assessments in a way that will discourage use." Another compared AI bans to restricting internet use, arguing "AI policies seem to be totally irrelevant. It's like telling people they can't use the internet as a resource for the class." This ineffectiveness of bans creates fairness concerns. As one student explained: "I think if it is banned in a class, that should be enforced (and right now it absolutely is not)... As with any form of cheating, those who don't cheat are put at a disadvantage." Another student expressed similar frustration: "I

find it discouraging when I hear classmates saying they use AI for things such as essays when they use it in dishonest ways."

D.2 Need for Clear Guidelines

The most frequently expressed concern was the need for clear guidelines about Generative AI use. Several students reported confusion about what constitutes acceptable use, with one noting "I think it should be more clear whether we can use it and how and how to cite it since most professors rarely mention it at all". Other students emphasized the importance of professors explaining their policies upfront and their rationale, with one stating "I think that Professor's should be very specific about what is allowed and their reasoning behind their policy".

Many students advocated for standardization across classes, observing that "Sometimes its confusing when one class allows it and another doesn't and the other encourages it and so on so if there was a school wide or department wide policy that could help". Yet there is also disagreement regarding standardization. Some students preferred leaving the decision to individual professors, arguing that "GenAI is more effective in some classes/majors than others. Making sure professors understand how students use GenAI and how useful GenAI is in their class (given the course structure, nature of assignments/material, etc.) is very important for the class policy."

D.3 Training and Support Services

Students strongly emphasized the need for training in appropriate Generative AI use. Many suggested that the college should provide guidance on using AI tools effectively while maintaining academic integrity. One student proposed "a workshop that teaches you to effectively use GenAI without violating the honor code". Students also expressed interest in learning how to leverage AI to enhance their learning experience rather than circumvent it. As one student explained: "I think it could be useful to develop some sort of training. How do we use AI in a way that actually benefits our learning? I tried out some things on my own but I feel that I need more guidance."

This desire for training was often linked to workplace preparedness. Students recognized that AI proficiency would be valuable in their careers, with one noting "As the world uses more and more AI, I think it is an important tool that students should know how to leverage". Another emphasized: "The moment us students leave campus, we will be using

it in the professional world, and when used in combination with one's own skills, it is merely a tool to maximize efficiency".

D.4 Discussion

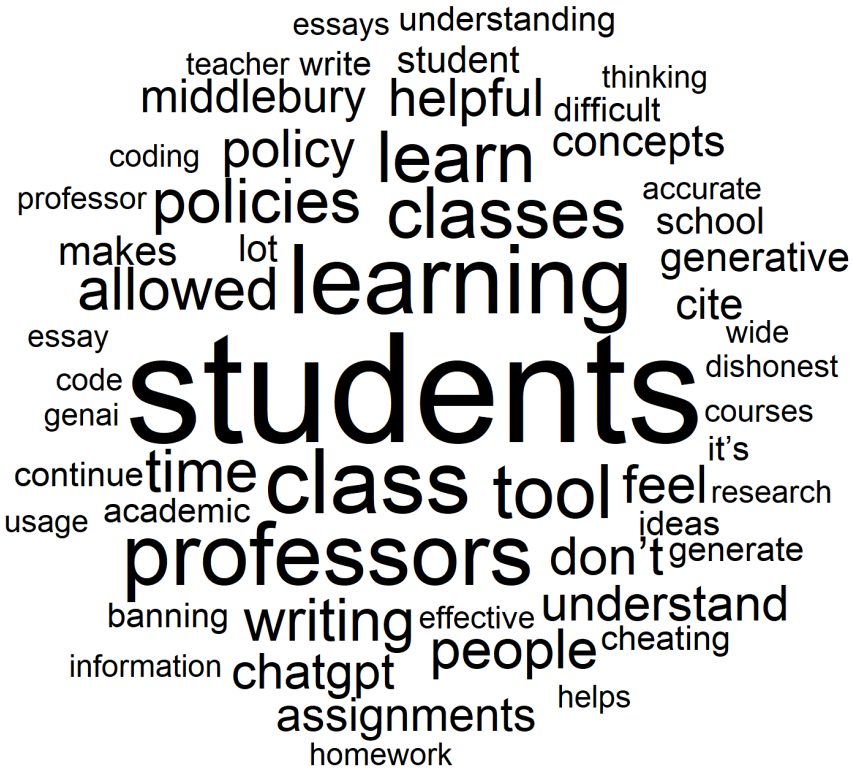
The responses reveal several key tensions in AI policy implementation. First, students express a desire to use AI in ways that enhance rather than substitute for learning, yet they recognize that blanket bans are ineffective and worry about being disadvantaged if they follow restrictions while others do not.

Second, while students desire clear guidelines, they also want flexibility to accommodate legitimate uses that vary by discipline and assignment type. Different courses and majors may find different AI uses appropriate based on their learning objectives and assessment types.

Third, there is tension between faculty autonomy in setting course policies and students' desire for consistent institutional standards. While some support letting professors determine appropriate AI use for their specific courses, others argue that varying policies across classes create confusion and enforcement challenges.

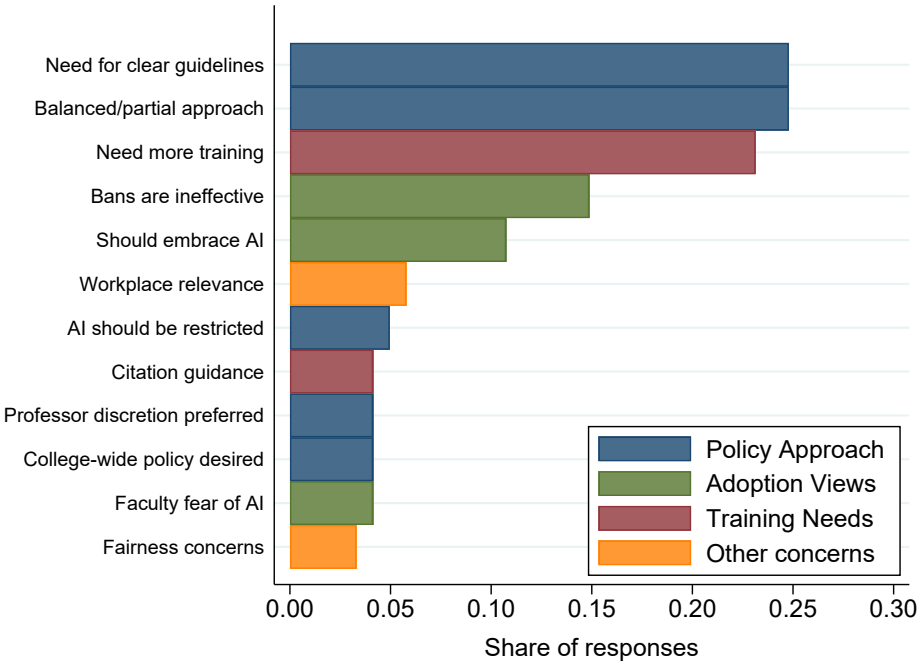
Finally, students report significant variation in faculty attitudes toward AI. Some students perceived faculty fear or misunderstanding of AI tools, noting that categorical bans often reflect a lack of understanding about AI's capabilities and limitations rather than pedagogical considerations.

Figure D1: Word Cloud of Student Feedback on Generative AI Policies



Notes: Word cloud displaying words that appear at least five times in 133 student responses after removing common English stop words and the word "AI". Text size is proportional to word frequency. The visualization is based on responses to the question: "Do you have any specific feedback or suggestions about Middlebury's Generative AI policies, resources, or support services?"

Figure D2: Frequency of Keywords in Student Feedback on AI Policies

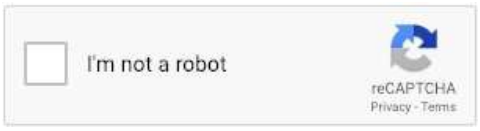


Notes: The figure shows the share of open-ended responses that mentioned different themes related to Middlebury's AI policies. The responses come from the question "Do you have any specific feedback or suggestions about Middlebury's Generative AI policies, resources, or support services?" Color coding indicates the category of each theme. Policy Approach captures suggestions about how AI should be regulated at the college. Adoption Views reflect positions on whether and how AI should be integrated into academic work. Training Needs indicates requests for guidance and support. Other Concerns include issues of workplace relevance and fairness.

E Survey Instrument

Default Question Block

Click below to confirm
you are human.



This is a consent form. Please read it carefully, and click below to accept and continue.

You are invited to participate in a research study on on students' use of technology in their academic and personal lives. The study should take around 5 minutes on average to complete. Participation in this survey is voluntary, and you can end your participation at any time by exiting the browser window. If you agree to participate in this study, you will answer questions about your technology use, preferences, and attitudes.

Eligibility: You must be over 18 to participate.

Compensation: As compensation for your time and effort, you will have the option to enter a drawing for multiple gift

cards ranging in value from $50 to $500. To enter the drawing, you will be directed to a separate form where you can provide your email address. Your email address cannot be connected to your survey responses.

Risks and Benefits: Your participation in this survey presents no greater risk than everyday Internet use. We cannot and do not guarantee or promise that you will receive any benefits from this study. Your participation may benefit society by improving our understanding of technology usage and its impacts.

Confidentiality: We will make no attempt to identify participants and will keep the data private by storing it securely in a password-protected file on Middlebury's secure servers. The anonymized responses of all survey participants may be shared with other researchers for academic research purposes. We will never share your name or any identifying information with anyone. While we are not collecting any direct identifying information, please be aware that in a small community like Middlebury, there is a very small possibility that some individuals' identities could be ascertained based on their responses.

Contact Information: This survey is being conducted for academic research purposes. The principal investigators are Professor Zara Contractor (zcontractor@middlebury.edu) and Professor Germán Reyes (greyes@middlebury.edu), whom you may contact for specific questions about the research study. For questions about your rights as a research

participant, you may contact the Middlebury College IRB at irb@middlebury.edu.

Agreement to Participate: By clicking to continue, you indicate that you have read this consent form and voluntarily agree to participate in the study.

- ○ I AGREE TO PARTICIPATE IN THIS STUDY
- ○ I DO NOT AGREE TO PARTICIPATE IN THIS STUDY

Thank you for your interest in this study. Since you did not agree to participate, you are ineligible to proceed.

First, we would like to ask you some questions about yourself.

Please answer each of the following questions:

What is your gender?

- ○ Male
- ○ Female

- ○ Non-binary / third gender
- ○ Prefer not to say

Which of the following categories best describes your race/ethnicity? (Please select all that apply)

- ○ White
- ○ Black or African American
- ○ Hispanic or Latino
- ○ Asian
- ○ _____ Other (Please specify)
- ○ Prefer not to say

For your final year of high school (or equivalent), what type of educational setting did you attend?

- ○ Public high school
- ○ Private high school
- ○ _____ Other (Please specify)
- ○ Prefer not to say

What is your current academic year?

- ○ First year (Freshman)
- ○ Second year (Sophomore)

- ○ Third year (Junior)
- ○ Fourth year (Senior)
- ○ Fifth year or beyond
- ○ Prefer not to say

What was your cumulative GPA in your first year at Middlebury? Please round to one decimal place. If you do not remember your exact first-year GPA, provide your best estimate.

On a typical week during the academic year, how many hours do you spend studying or working on assignments outside of class?

What is your primary major?

- ○ [ ] My primary major is:
- ○ I have not declared a major
- ○ Prefer not to say

What is your intended primary major?

Intended Primary Major

AI Use

Next, we will ask some questions about your experiences with Artificial Intelligence tools.

There are no right or wrong answers - we are interested in understanding your honest perspectives and experiences.

Please remember that your responses are **completely anonymous** and this study has been reviewed and approved by Middlebury College's Institutional Review Board. The research team cannot link your responses to your identity in any way.

Have you ever used any form of Generative AI such as ChatGPT, GitHub Copilot, Claude, etc.?

- ○ Yes

- ○ No

How often do you use Generative AI tools during the academic semester?

- ○ Never
- ○ Rarely (a few times a semester)
- ○ Occasionally (a few times a month)
- ○ Frequently (a few times a week)
- ○ Very frequently (daily or almost daily)

When did you first start using any form of Generative AI for academic purposes?

- ○ This semester (Fall 2024)
- ○ Last semester (Spring 2024)
- ○ Fall 2023
- ○ Spring 2023
- ○ Before Spring 2023

Which of the following AI tools do you currently use on a regular basis during the academic year? (Select all that apply)

- ☐ ChatGPT (Free version)
- ☐ ChatGPT (Paid version)

- [ ] Claude (Free version)
- [ ] Claude (Paid version)
- [ ] Meta LLaMA
- [ ] Google Gemini
- [ ] Midjourney
- [ ] Microsoft Copilot
- [ ] GitHub Copilot
- [ ] Other (please specify) _____

For academic purposes, which of the following tasks do you typically use Generative AI for? (Select all that apply)

	Never	Rarely (few times per semester)	Occasionally (few times per month)	Frequently (few times per week)	Very frequently (daily or almost daily)
Proofreading	○	○	○	○	○
Creating images	○	○	○	○	○
Editing essay drafts	○	○	○	○	○
Finding information	○	○	○	○	○
Explaining concepts	○	○	○	○	○
Generating ideas	○	○	○	○	○
Coding assistance	○	○	○	○	○
Composing emails	○	○	○	○	○
Writing essays	○	○	○	○	○

	Never	Rarely (few times per semester)	Occasionally (few times per month)	Frequently (few times per week)	Very frequently (daily or almost daily)
Summarizing materials	○	○	○	○	○

How much do you currently pay per month for Generative AI subscription services?

- ○ $0 (I don't have an active paid subscription)
- ○ $0 (but I used to pay)
- ○ Between $1 and $20
- ○ Between $21 and $40
- ○ More than $40

Effects on academics and learning

We'd like to understand how Generative AI affects different aspects of your academic experience.

For each item below, please indicate whether you think AI use has a positive, negative, or has no effect.

Remember, there are no right or wrong answers - we're interested in your personal experience.

	Significantly improves	Somewhat improves	No effect	Somewhat reduces	Significantly reduces	I don't know
Your learning (e.g., your ability to grasp concepts, retain information, or learn new skills)	○	○	○	○	○	○
The amount of time you spend on academics (e.g., assignments, studying)	○	○	○	○	○	○
Your understanding of course material	○	○	○	○	○	○
Your grades	○	○	○	○	○	○
Your ability to complete assignments on time	○	○	○	○	○	○

Institutional policies

Next, we would like to understand your experience with Middlebury College AI policies.

Do you find the Generative AI use policy in the majority of your current classes to be clear?

- ○ Yes: I understand when and where I'm allowed to use AI.
- ○ No: There is no AI policy in place.

- ○ No: The AI policy is unclear or vague.

If a class's AI policy says you need to cite Generative AI use, would you know how to do so?

- ○ Yes
- ○ No

How likely are you to use Generative AI in a class with each of the following AI policies? (Please rate from extremely unlikely to extremely likely.)

	Extremely unlikely to use AI	Unlikely	Neutral	Likely	Extremely likely to use AI
AI use is prohibited entirely.	○	○	○	○	○
AI use is allowed if cited.	○	○	○	○	○
AI use is unrestricted.	○	○	○	○	○
No explicit AI policy is provided.	○	○	○	○	○

Are you aware that you have access to the premium version of Microsoft Copilot through Middlebury College?

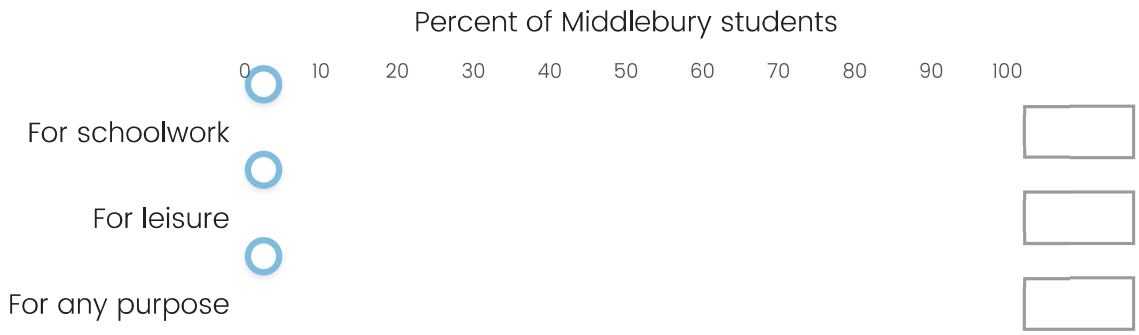
- ○ Yes

○ No

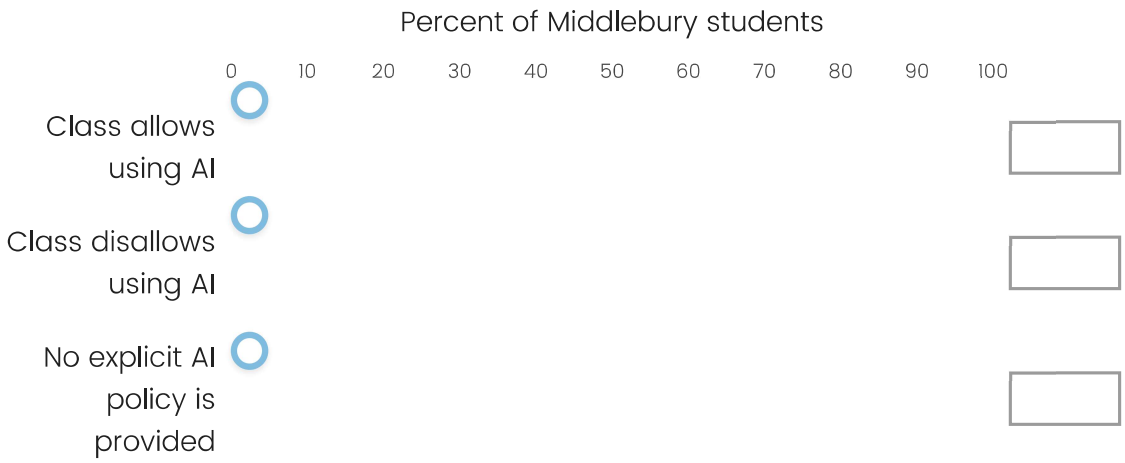
Others use

Next, we would like to understand your perceptions about Generative AI usage among other Middlebury students.

What fraction of Middlebury students do you think regularly use Generative AI tools? (Please provide your best estimate for each)



What percent of Middlebury students do you think regularly use Generative AI tools for classes with the following AI policies:



Factors influence AI

Please describe the factors that have personally influenced your use of Generative AI in your academic work. What initially led you to try it, what has motivated you to use it or caused you to hesitate? (Optional)

Do you have any specific feedback or suggestions about Middlebury's Generative AI policies, resources, or support

services? (Optional)

Completion

Thank you for completing our survey! Your responses have been recorded and will help us better understand how students engage with AI technology.

To enter the lottery for gift cards ranging from $50 to $500:

1. Click the link below to submit your email address
2. Enter the following unique code **${e://Field/Random%20ID}**
3. Your email submission will be collected separately from this survey.

Submission link

Important Privacy Note:

- The Google Form collecting emails is completely separate from this survey
- Your survey responses remain anonymous

- The research team cannot link emails to survey responses
- Emails will only be used for the lottery and will be deleted after the drawing

You may now close this window.

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