

Guiding, Not Ghostwriting: A Course-Specific GPT for Reflection in First-Year Courses

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Abstract

This evidence-based practice paper investigates how students use a course specific GPT in the areas of reflective writing and metacognition in a first-year mechanical engineering seminar course.

Generative AI tools are easily accessible to students and have the potential to affect the ways they interact with course content in a variety of ways. These tools have the potential to enhance learning but also can be easily misused. We believe that one way to support productive use of generative AI tools is to guide students in effective use of generative AI within a course specific GPT.

Building on prior work with first-year mechanical engineering students showed that 42% were already using generative AI and 75% planned to use it in the future. Additionally, 70% believe these tools can enhance learning when used appropriately. This study examines the results of a survey of students in a first-year, introduction to mechanical engineering seminar course (N=234) to characterize how students use the course GPT (e.g., clarifying expectations, brainstorming/refining ideas, feedback on clarity/tone/structure, prompts to deepen reflection, pointers to textbook sections). We further evaluate how useful students perceive the tool to be for reflection and learning, and whether the availability of a reflective GPT lowers temptation to cheat (e.g., using AI to produce “reflections”). Survey analysis assesses perceived improvements in reflection quality, temptation to use AI, and students’ preference of course-aligned prompts and guidance over general-purpose AI outputs for reflective tasks.

Keywords: Generative Artificial Intelligence, Student Perceptions of AI, First-Year Engineering Students

Introduction and Background

Generative Artificial Intelligence (AI) is a tool that students encounter frequently. Supporting students to learn how to use AI tools effectively and ethically is a key goal to supporting their learning in an era where AI tools are readily accessible. The purpose of this study is to implement a course specific AI tool into a first-year introduction to engineering course and to investigate students' experiences and perceptions of the tool. This evidence-based practice evaluation was guided by the following questions:

- To what extent did students adopt and engage with the course-specific Reflective Guide GPT?
- For what purposes did students use the GPT, and how helpful did they perceive it to be?
- How did students perceive the GPT's influence on reflection/metacognition and integrity-related attitudes?
- How (if at all) did prior AI experience relate to adoption and perceived outcomes?

Generative AI is changing student learning and instructors are now faced with the responsibility of inciting policies, informing students in real time of best practices, as well as managing restrictions regarding use of the platform. A review of 100 US universities [1] showed that zero percent of universities are banning AI use, and the majority are leaving the AI policies up to the instructor. The literature research suggested that AI will not replace learning institutions but likely enhance the learning experience for students through personalized learning, bridging the gap between academia and industry, and other types of customized tools to benefit student needs. When asked, students acknowledged the concerns behind AI but also exposed limitations regarding the platform. A study in 2024 [2] found only 4% of students used AI weekly, whereas a survey conducted for this research said 42% of students were already using ChatGPT, and this number is likely increasing with more platforms becoming available and access getting easier.

Despite the benefits linked to student learning using AI, many argue that generative AI could lead to academic dishonesty and loss of critical thinking. Sellnow [3] showed that new tech and different ways of teaching are often intimidating and pushback is almost always incited due to unconscious bias to want to do things the way we know them / methods already familiar to us. Adapting to new methods ensures we keep up with the latest technologies and use them as a resource (similar to teachers embracing textbooks to prepare students for class, television used as a learning resource, instructors embracing the internet for research, etc.). Many argue that plagiarism is a threat to authentic work and can undermine the development of critical thinking. Research also exposed that students were aware that over reliance could be a residual consequence to using AI platforms. Given that generative AI tools are likely to remain widely accessible, understanding how students actually engage with course-aligned AI support is increasingly important.

Methods

This study was conducted during the Fall 2025 term in ME163, a first-year seminar course at the California Polytechnic State University, San Luis Obispo (Cal Poly). ME163 is based on the "Design Your Process to Become a "World Class" Engineering Student" (DYP) program [4]. The

DYP program is a comprehensive intervention aimed at helping students develop self-regulation and success skills. It focuses on goal setting, community building, academic development, and personal development. The program covers student development topics in a first-year engineering course/lab/seminar, and students are asked to design their own process for success and write a reflective, comprehensive report. For the Fall 2025 term students were asked to write four reflective homework assignments (~1000 words per assignment) and a reflective comprehensive report (~4000 words).

To support students' reflective writing and metacognitive development while minimizing opportunities for misuse of generative AI, a course-specific GPT was developed, referred to in this paper as the ME163 Reflective Guide. This custom GPT was created using the OpenAI GPT Builder and programmed with detailed instructional constraints aligned with ME163 learning outcomes and academic integrity expectations. Students could access the GPT via a link on the ME163 Canvas homepage. In addition to the guidelines outlined in the syllabus, a brief 10-minute lecture at the course's start covered the usage of AI tools in general and how to use the ME163 Reflective Guide. The course syllabus statement regarding AI and the GPT is included in Appendix A.

The ME163 Reflective Guide was designed to serve as a reflective writing coach and mentor rather than a text generator. Its primary instructional goal was to promote deep personal engagement with course content, metacognitive awareness and self-evaluation, clear, structured reflective writing, and independent thinking and academic integrity. This design aligned with the reflective emphasis of ME163 and the course textbook *Studying Engineering*, which outlines strategies for intentional learning, self-assessment, and personal development [5]. The GPT was expected to model and reinforce these reflective strategies, not replace student effort. The tool was explicitly intended to lower the temptation to cheat by preventing students from generating reflective content through AI. Instead, the intent was to support students in developing their own reflections.

The GPT was programmed with a custom system prompt emphasizing its role as a reflective coach for first-year mechanical engineering students. Core instructional rules included:

- Do not complete or write assignments for students.
- Instead, the GPT prompts deeper thinking through open-ended questions, encourages self-evaluation, and helps students clarify ideas.
- Provide feedback—never finished text.
- When students upload drafts, the GPT gives feedback on clarity, structure, tone, and depth of reflection, reinforcing independent revision.
- Refer to textbook sections rather than providing answers.
- The tool may guide students toward relevant chapters or page numbers from the uploaded course textbook, but it must not quote, summarize, or reproduce textbook content.
- Do not assist with quizzes or tests.
- Maintain a supportive, professional tone.
- The GPT was designed to act as a mentor focused on student development and ethical learning habits.

Uploaded materials included the course textbook, all four reflective homework assignments, the final reflective report instructions, and the report template. These materials allowed the GPT to contextualize feedback and connect student questions to course expectations without generating prohibited content. To reinforce its role as a reflective-only tool, all optional capabilities of the GPT Builder were intentionally disabled. Specifically, web search, Canvas integration, Image generation, code interpreter/data analysis were all left disabled. Disabling these capabilities ensured that the GPT remained a text-only reflective coach incapable of retrieving outside information, executing code, generating artifacts, or producing full written assignments. The restricted capability set also supports academic integrity by preventing students from using the tool for unintended tasks.

Cal Poly provides institutional access to ChatGPT, allowing students to use the ME163 Reflective Guide through a secure link posted on the course Canvas page. Access was optional, and the GPT did not collect identifiable personal data. Consistent with Cal Poly's agreement with OpenAI, student interactions within the campus workspace are not used to train OpenAI models. Students were given the option to try the tool, rather than required. This allowed students who were interested in trying it to have the opportunity, without forcing any students who were not interested in its use. An identical "open" version of the GPT was created so that researchers and readers of this paper may examine its behavior. This open version replicates the instructions and constraints of the course-embedded GPT but does not provide access to institution-restricted files [5].

A mixed-methods end-of-term survey was used to characterize students' engagement with the ME163 Reflective Guide GPT and to examine perceptions of its usefulness for reflective writing, metacognition, and academic integrity. The survey instrument consisted of six sections (A–F) and combined multiple-choice, Likert-scale, and open-response items, see Table B1 in Appendix B and Figure 1. Branching logic ensured that students only saw questions relevant to their usage of the ME163 GPT.

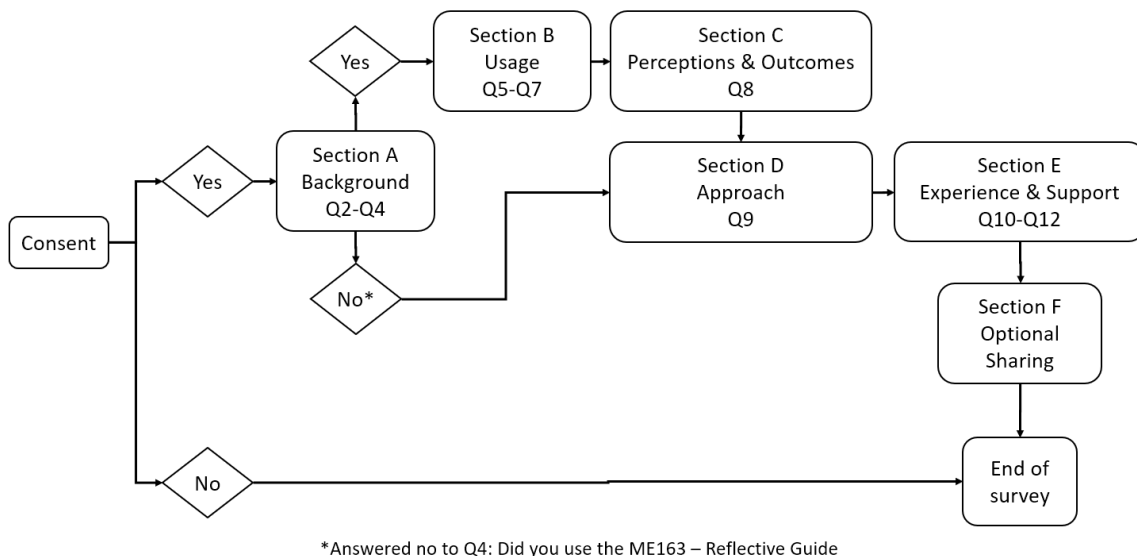


Figure 1: Survey Instrument Logic

The survey instrument was made available to all first-year students (N=234) via in-class announcement and on the learning management system (LMS) following the IRB-approved recruitment script. The survey instrument was available to students for the last three weeks of the fall term. In the consent form presented at the beginning of the survey instrument, students were informed that their participation is entirely voluntary, with no penalties or loss of benefits for choosing not to participate. Students will neither be penalized for non-participation nor rewarded for participation in the survey. Grades were assigned independently of the survey and prior to any research analysis. Students had the option to leave any survey questions unanswered.

We summarized survey items using descriptive statistics (frequencies/percentages and central tendency as appropriate). Associations between categorical variables (e.g., GPT-use status and approach to AI for graded reflections) were tested using chi-square tests; when expected cell counts were small, we report Monte Carlo/exact p-values rather than relying on asymptotic approximations. Effect sizes for chi-square tests are reported using Cramer's V. To examine whether prior AI experience related to engagement or perceived outcomes among students who tried/used the GPT, we collapsed prior AI frequency into low (never/rarely) vs. high (sometimes/often) and used Mann-Whitney U tests for ordinal outcomes, reporting effect sizes as r. Qualitative open-ended responses were coded into themes and illustrated with representative excerpts.

Data Analysis and Discussion

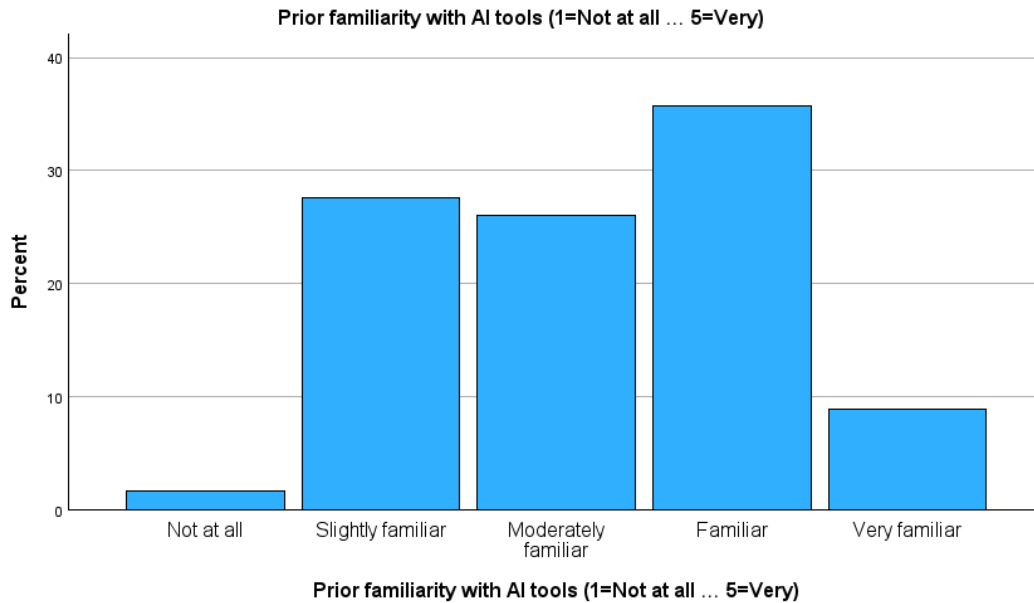
Quantitative Analysis

Out of N=234 students enrolled in ME163, n=123 students agreed to participate in the study (52.6% participation rate), and n=111 did not participate. All quantitative analyses reported below are based on responses from the 123 students who provided consent and completed the survey.

Section A – Background

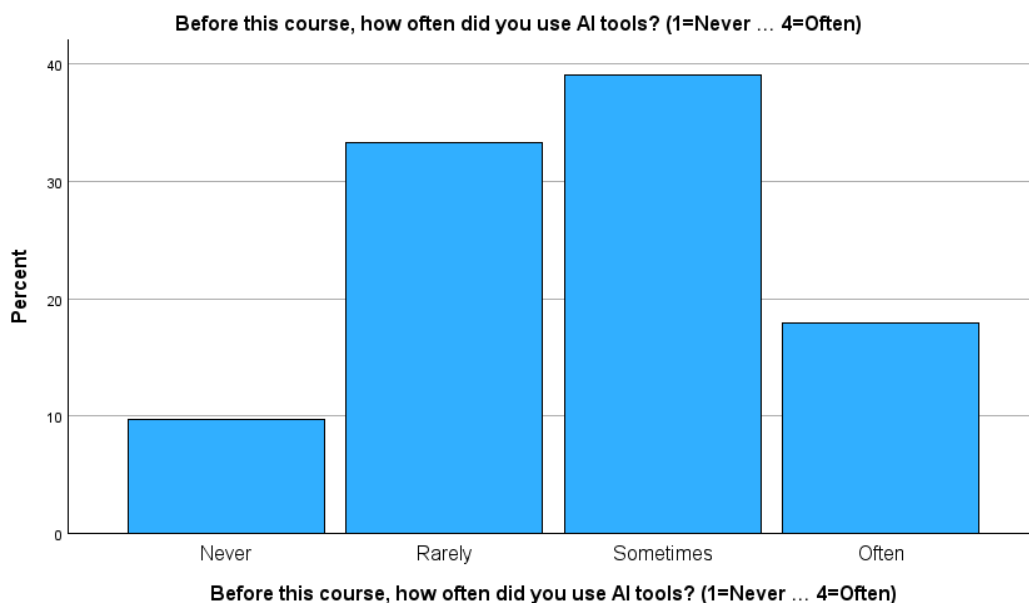
Prior familiarity with AI tools:

Students reported moderate prior familiarity with AI tools (Mean=3.23, SD=1.01; Median=3; n=123). The largest proportion of respondents indicated that they were familiar with AI tools (35.8%), followed by slightly familiar (27.6%) and moderately familiar (26.0%). Fewer students reported being very familiar (8.9%), and only a small fraction indicated no familiarity at all (1.6%). Overall, the distribution suggests that most students entered the course with at least some prior exposure to AI tools.



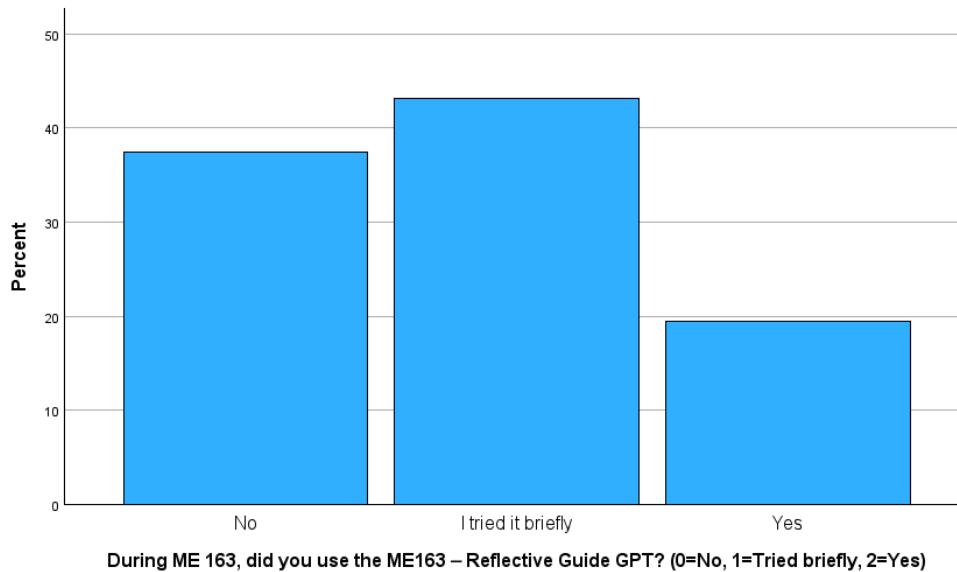
Frequency of AI tool use prior to the course:

Before the course, most students reported at least occasional use of AI tools (n=123). The largest proportion indicated using AI tools sometimes (39.0%), followed by rarely (33.3%). Fewer students reported using AI tools often (17.9%), while a smaller subset indicated that they never used AI tools prior to the course (9.8%). Overall, these results suggest that while regular use was not universal, the majority of students had some prior experience with AI tools before enrolling in the course.



Use of the course GPT:

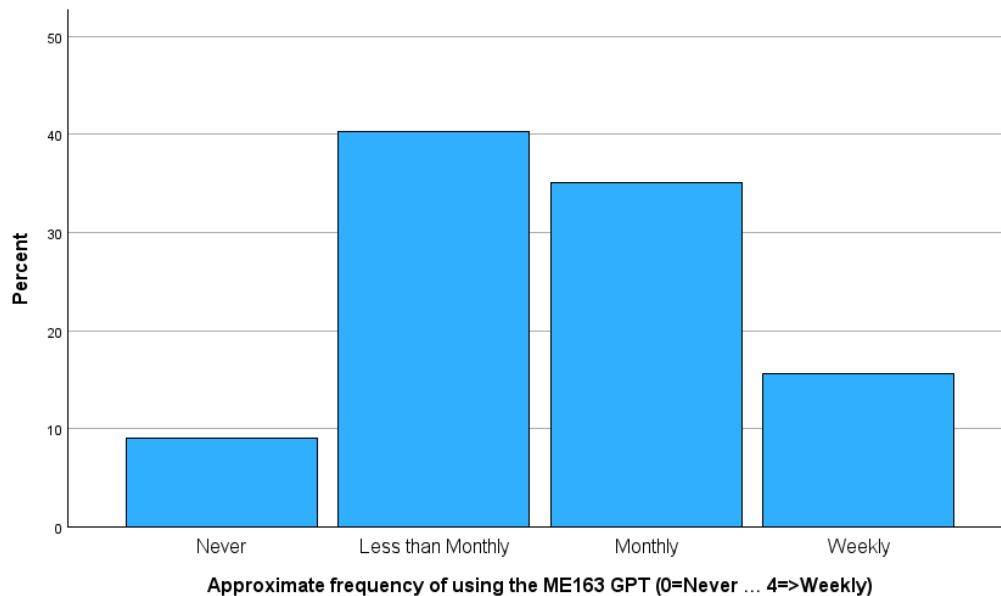
When asked whether they used the ME163 – Reflective Guide GPT during the course (n=123), 19.5% of students reported using it, 43.1% reported that they tried it briefly, and 37.4% reported that they did not use it. Taken together, 62.6% (N=77) of respondents indicated at least some engagement with the course GPT (i.e., tried briefly or used), suggesting that while sustained use was limited to approximately one-fifth of respondents, a majority experimented with the tool at least once during the course.



Section B: Usage of GPT

Frequency of GPT use among users:

Among students who were categorized as GPT users (n=77), reported use of the ME163 – Reflective Guide GPT was generally infrequent (Mean=1.57, SD=0.86; Median=2). The most common response was using the GPT less than monthly (40.3%), followed by monthly use (35.1%). A smaller subset reported weekly use (15.6%), while 9.1% of students in the user group selected never, suggesting that some students who indicated trying the GPT at least once did not report sustained or repeated use on this frequency item.



How students used the course GPT:

Among GPT users, 73 students provided valid responses to the “check all that apply” item describing how they used the ME163 – Reflective Guide GPT (4 responses missing). The most commonly selected use was brainstorming/refining ideas for their reflection (71.2% of respondents), followed by getting feedback on clarity/tone/structure (52.1%) and clarifying assignment expectations in their own words (41.1%). Smaller proportions reported using the GPT for prompts to deepen reflection/metacognition (30.1%) and for pointers to textbook sections (28.8%). Two students additionally selected “Other,” describing use of the GPT to locate textbook references for the final report and to obtain tips on connecting with mechanical engineering faculty.

Perceived helpfulness of the course GPT by use type:

Among GPT users, perceived helpfulness ratings were generally positive across all use types (1=not helpful to 5=very helpful), with mean ratings ranging from 3.70 to 4.09. Detailed statistics by use type are provided in Appendix C (Table C1); because students rated only the use types they selected, item-level sample sizes vary. The highest ratings were observed for using the GPT to obtain feedback on clarity/tone/structure ($M=4.09$, $SD=0.94$; $n=54$) and for brainstorming/refining ideas ($M=4.05$, $SD=0.92$; $n=56$). Using the GPT to clarify assignment expectations was also rated favorably ($M=3.94$, $SD=1.04$; $n=48$). Ratings were slightly lower—but still above the midpoint—for reflection/metacognition prompts ($M=3.70$, $SD=1.04$; $n=47$) and pointers to textbook sections ($M=3.77$, $SD=1.19$; $n=43$). Consistent with these mean scores, a majority of respondents who rated each item selected either helpful or very helpful (e.g., brainstorming: 82.1%; feedback: 74.0%; clarifying expectations: 70.8%).

Perceptions and outcomes associated with GPT use:

Perceptions of the ME163 Reflective Guide GPT were generally positive among respondents who reported using the tool (item-level $n=72-75$; valid n listwise=70). Detailed descriptive

results are provided in Appendix C (Table C2). These items were presented only to students who indicated at least some use of the GPT, and means/standard deviations exclude missing responses, resulting in slightly different n values across statements. Students tended to agree that the GPT supported their learning and writing processes, including helping to structure reflections (M=3.71, SD=0.68), reflect more deeply (M=3.49, SD=0.76), and improve clarity and tone (M=3.63, SD=0.74). Students also moderately agreed that the GPT encouraged consulting the textbook rather than relying on summaries (M=3.54, SD=0.83).

Several items focused on academic integrity and appropriate AI use. Students agreed that clear course guidance about AI use reduced temptation to misuse AI (M=3.84, SD=0.74), and reported moderate agreement that simply knowing the GPT was available reduced temptation to use AI to write reflections for them (M=3.73, SD=0.83). Students expressed high agreement with broader statements about AI, including that AI tools can enhance student learning when used appropriately (M=4.37, SD=0.63) and that AI tools can make it easier to cheat if misused (M=4.11, SD=0.73). Finally, students reported strong agreement that they feel confident using AI ethically (M=4.17, SD=0.74) and that the ME163 GPT aligns with course goals related to growth, integrity, and independent thinking (M=3.95, SD=0.70).

Section D - Approach

Approach to AI use for graded reflections in the course:

This question was presented to all consenting students, regardless of whether they reported using the ME163 Reflective Guide GPT. When asked what best described their approach to AI for graded reflections in ME163 (n=123), most students reported using AI in a limited capacity or not at all. Specifically, 52.8% of respondents indicated that they used AI only for brainstorming or feedback on a draft, while 43.1% reported that they did not use AI for graded reflections. Only 4.1% of students reported sometimes using AI to generate text that they then edited. Overall, these findings suggest that students primarily used AI as a support tool for ideation and revision rather than as a means of generating graded reflection content.

Because this question was presented to all students, we also examined whether students' reported approach to AI for graded reflections differed by whether they used or tried the ME163 Reflective Guide GPT. A chi-square test indicated a significant association between GPT use status and students' reported approach, $\chi^2(2, N=123)=24.68, p<.001$ (Monte Carlo exact $p<.001$), with a moderate-to-large effect (Cramer's $V=.448$). Within the GPT user/try group (n=77), most students reported using AI only for brainstorming/feedback (70.1%), whereas this approach was less common among GPT non-users (n=46; 23.9%). Conversely, GPT non-users were more likely to report not using AI for graded reflections (69.6%) compared to GPT users/try (27.3%). Self-reported use of AI to generate text and then edit was uncommon in both groups (non-users: 6.5%; users/try: 2.6%), and adjusted residuals indicated that the association was driven primarily by the first two response categories (no AI vs. brainstorming/feedback).

- ➔ Students who used or tried the ME163 GPT were much more likely to report using AI only for brainstorming/feedback, whereas non-users were more likely to report not using AI for graded reflections

Section E - Experience & Support

Questions 10 and 11 are qualitative and are analyzed in the Qualitative Analysis section.

Reasons for not using the course GPT:

This question was intended for students who reported not using the ME163 Reflective Guide GPT; therefore, analyses were restricted to respondents who selected “No” on question 4 (n=46). Of these non-users, 37 students selected at least one reason (9 missing). The most commonly selected reason was not seeing value in using the GPT (62.2% of non-users who responded), followed by preferring other tools (27.0%). Fewer students cited time constraints (18.9%) or access issues (13.5%). In open-text “Other” responses (n=4), students described concerns about ethical use of AI, a desire to rely on their own thinking and writing process, and environmental impact; one student indicated an intention to use the GPT later (e.g., for the final paper).

Test whether prior AI habits predict using the course GPT:

To support between-group analyses based on baseline AI experience, prior AI tool use frequency (question 3) was collapsed into a two-level variable: low prior AI use (never/rarely) and high prior AI use (sometimes/often). Using this grouping, 43.1% of students were classified as low prior AI users (n = 53), and 56.9% were classified as high prior AI users (n = 70).

Prior AI experience as a moderator of perceived GPT outcomes (question 8):

To examine whether baseline AI experience influenced perceived outcomes among students who reported using or trying the ME163 Reflective Guide GPT, prior AI tool use (question 3) was collapsed into low prior use (never/rarely) and high prior use (sometimes/often), and groups were compared using Mann–Whitney U tests. Overall, perceived reflection-quality benefits were largely similar across groups. No significant differences were observed for the GPT helping students reflect more deeply ($U=625.00$, $p=.818$; $r\approx.03$) or improve clarity and tone of writing ($U=595.50$, $p=.796$; $r\approx.03$). A small, non-significant trend suggested that students with higher prior AI use rated the GPT as more helpful for structuring reflections ($U=492.50$, $p=.095$; $r\approx.20$).

Similarly, integrity- and temptation-related perceptions did not differ significantly by prior AI experience. Students with low versus high prior AI use reported comparable agreement that GPT availability reduced temptation to use AI to write reflections ($U=617.00$, $p=.749$; $r\approx.04$) and that clear course guidance reduced temptation to misuse AI ($U=546.00$, $p=.232$; $r\approx.14$). Taken together, these results suggest that perceived benefits and integrity-related outcomes associated with the course GPT and accompanying guidance were broadly consistent across students with lower versus higher baseline AI tool use.

- ➔ Prior AI experience was not strongly associated with either adoption of the course GPT or perceived outcomes among users, suggesting that extensive prior AI experience was not necessary to engage with or benefit from the course GPT.

Prior AI experience → frequency of GPT use (question 5):

Among students who reported using or trying the ME163 Reflective Guide GPT, we examined whether prior AI tool use was associated with frequency of GPT engagement. Mann–Whitney U results indicated no statistically significant difference in reported GPT-use frequency between students with low prior AI use (never/rarely) and high prior AI use (sometimes/often), $U = 591.00$, $p = .241$. Although the high prior AI group showed higher mean ranks (41.19 vs. 35.38), the effect was small ($r \approx .13$), suggesting that baseline AI experience was not a strong predictor of how frequently students engaged with the course GPT.

- ➔ Prior AI experience did not meaningfully predict how often students engaged with the course GPT

Prior AI experience → perceived helpfulness of the course GPT (question 7):

Next, we tested whether students with different baseline AI experience valued specific forms of GPT support differently. Helpfulness ratings were largely similar across groups for using the GPT to obtain draft feedback ($U=310.00$, $p=.432$; $r \approx .11$) and for pointers to textbook sections ($U=190.50$, $p=.734$; $r \approx .05$). However, students with higher prior AI use rated the GPT as significantly more helpful for clarifying assignment expectations ($U=146.00$, $p=.004$; $r \approx .41$). A similar, though not statistically significant, pattern was observed for reflection/metacognition prompts ($U=153.00$, $p=.055$; $r \approx .28$) and brainstorming/refining ideas ($U=264.00$, $p=.073$; $r \approx .24$), with higher mean ranks among students reporting more frequent prior AI use.

- ➔ Prior AI experience was not strongly related to perceived helpfulness for most use types; however, more frequent prior AI users reported greater perceived value for GPT support related to interpreting course expectations and, to a lesser extent, reflection scaffolding.

Integrity norms asked of everyone: Prior AI experience and approach to AI for graded reflections (question 9)

Because question 9 was presented to all consenting students, we examined whether students' self-reported approach to AI for graded reflections differed by prior AI tool use (low: never/rarely; high: sometimes/often). A chi-square test indicated a significant association between prior AI experience and reported approach to AI for graded reflections, $\chi^2(2, N=123)=7.72$, with Monte Carlo/exact $p=.017$ (asymptotic $p=.021$). The association was small-to-moderate in magnitude (Cramer's $V=.250$). Students with low prior AI use were more likely to report not using AI for graded reflections (54.7%) compared to students with high prior AI use (34.3%). Conversely, students with high prior AI use more frequently reported using AI only for brainstorming/feedback (58.6%) relative to low prior AI users (45.3%). Self-reported use of AI to generate text and then edit was rare overall ($n=5$) and occurred only among students in the high prior AI group (7.1%).

- ➔ Students with higher prior AI use were more likely to report using AI for brainstorming/feedback, whereas students with lower prior AI use more often reported not using AI for graded reflections.

Qualitative Analysis

There were two questions in the survey that were qualitative in nature and we present the results of those questions in this section. The questions were:

10. Pros and cons you experienced using the ME163 GPT.

11. What support/resources would help students use AI productively and ethically?

For question 10, the pros listed by students primarily included: pointing to/helping with resources, helping brainstorm ideas, formatting help, and providing feedback. Examples of student responses in each of these areas are included in Table 1. Overall, students pointed to the ease of using it to help with course resources because it knew the course material and textbook well. Students also commented on the pros of the tool in being fast to use and that it could help them focus their ideas, both in their brainstorming and when they were asking for feedback about specific things like formatting reports. Students credited some of these pros to the tool knowing the course materials well.

Table 1. Summary of qualitative results for question 10: Pros of the ME163 Reflective Guide GPT

Code	Sample student responses
Pointing to/helping with resources	“It was good at summarizing the rubric and making sure you were following it” “Pros of using the ME163 GPT is that it knows the text so if I needed clarification on something about the text, the AI could guide me.” “Pros I experienced were being able to have access to help that is based on the course requirements and textbook at any time of the day.”
Brainstorming ideas	“Very good at giving ideas on what to write, good at posing questions for me to think about” “Helped me get deeper into my thoughts and helped with brainstorming when I didn’t know what else to add.”
Formatting help	“Pros were that it helped cut time away with certain busy work like structuring assignments in the overall essay.” “Felt it accurately led me to understanding what the prompts were asking of me and how to go more in-depth.”
Providing feedback	“The pros of using this GPT were specifically allowing me to see what my tone is and how I can strengthen what I was trying to say. It gave me needed feedback that I wouldn’t typically be able to get from peers.”

	“It was beneficial for revising and editing my work (drafts). It helped me clarify my writing and make sure my ideas connected back to the text.”
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In question 10, few students gave cons about the use of the tool. The responses that were given as cons consisted of ease of access, errors/not understanding the student, difficulty of using images/diagrams, and takes away from own thinking. Sample student responses are given in Table 2.

Table 2. Sample student responses to Question 10: Cons of using ME163 Reflective Guide GPT

Code	Sample Responses
Ease of access	“Con: It is easy to forget it exists since I am not constantly looking at the canvas' home page”
Errors/not understanding student	“It helps brainstorm ideas, but sometimes can make bad assumptions.” “GPT gave extremely fast and in-depth responses but you did have to be extremely specific in your questions as it sometimes gave wrong or inappropriate responses.”
Difficulty of using images/diagrams	“Cons: not good with diagrams”
Takes away from own thinking	“It is very informative on assignments, It also gives good brainstorming ideas. However, sometimes it takes away from your own ideas, and can distract your thinking process.”

For question 11, many students gave responses with suggestions of how to productively and ethically use AI. 72 students gave some response to this question. Many of the student responses fell within the category of direct instruction in AI use. For example, students said:

- “Presentations on how a person can use a [sic] AI to study effectively without being ethically wrong.”
- “Maybe a lecture or real examples of what it looks like to use AI ethically vs. using non-ethically.”
- “Info sessions detailing how AI can aid study instead of facilitating cheating.”
- “Education and don't tell them that it's horrible and never use it.”
- “Setting aside a bit of class time to teach students how to effectively use AI in different ways.”

Many students volunteered that having limits put on the AI, such as for the specific needs of the class, would help them use AI productively and ethically. For example, student responses included

- “Having access to AI tools that are catered to a specific class like this one could help students use it more productively.”
- “Having access to AI sources that assist rather than do your work for you helps students use AI ethically. For example, I have used NotebookLM, which is an AI source that takes my notes and helps generate podcasts and other study tools. These resources assist my study process, but do not think for me.”
- “The fact that it new [sic] everything for the course [sic] but wouldn’t just do the work for you helps you actually write it yourself”

Students also included that having clear boundaries and guidelines on the use of AI would help them use it productively and ethically. For example, students said:

- “Being told on what is and isn't acceptable whenever students use AI.”
- “Informing students that AI is a tool to improve writing, but it should not do the thinking and writing for them.”
- “Teaching students to not depend on AI by having them practice drafting on their own and only using AI for ideas and help editing.”

In addition, several students specified that being able to use images and diagrams within the AI would help them use it more productively. For example, students said:

- “The use of adding images to better provide information.”
- “Adding images to be more specific on what you want it to analyze.”

Overall, these qualitative responses show that students see many positives of using AI resources such as the course specific GPT used in this study. However, students are looking for clear boundaries and expectations about their use. Students are welcoming of resources to use the tools effectively, including coursework and lectures on AI. They saw the course specific GPT tool as one way to meet this need, and pointed out benefits to learning how to use AI tools in this context as helping them learn the skills to use AI without taking away from other critical learning objectives, such as being able to write effectively and brainstorm diverse ideas.

Limitations and Future Research

This study was implemented in a single first-year mechanical engineering seminar course at Cal Poly during the Fall 2025 term. As a result, findings may not generalize to other institutional contexts, course structures, or reflection-writing demands. In addition, results come from a voluntary end-of-term survey (n=123 of N=234 enrolled; 52.6% participation rate). Because participation was voluntary and not all enrolled students responded, the sample may not be fully representative of the full course population.

A key limitation of this study is that access to the GPT was intentionally optional and positioned as a reflective support tool rather than a required tool. We expected students to experiment with it while a smaller subset would adopt it routinely. Student-reported barriers and preferences are consistent with this pattern: among non-users, the most common reasons were not seeing value and preferring other tools (the survey did not ask students to identify which external AI platforms they used (if any) or whether the course-specific GPT displaced general-purpose tools). For evidence-based practice, this suggests that instructors who want broader uptake should reduce adoption barriers (e.g., LMS-embedded access, brief onboarding demonstrations, and exemplar prompts).

Future research should test implementation strategies designed to reduce adoption barriers and support sustained engagement with the course-specific GPT. For example, instructors could embed direct access to the tool within the learning management system and within each reflection assignment, provide a brief in-class onboarding demonstration that models an “AI-as-coach” workflow aligned with course expectations, and supply exemplar prompts and sample interactions that illustrate appropriate use (e.g., brainstorming, feedback on structure, and revision planning rather than text generation). Studies could then examine whether these implementation supports increase not only initial uptake, but also continued use across the term, and whether increased sustained use is associated with improved student-perceived usefulness, stronger reflection processes, and higher-quality reflections.

Future research should also explore incorporating comparison conditions (e.g., general-purpose AI with a standardized prompt template, peer/TA feedback supports, or other constrained “coach” tools) versus the course-specific GPT to determine whether the course-specific GPT provides unique value beyond existing supports, yields greater perceived helpfulness and/or stronger reflection outcomes, or functions best as a complementary tool when used in parallel with other feedback approaches.

Qualitative follow-up (interviews or focus groups) could also clarify how students interpret “ethical use” and why some students choose not to engage.

Conclusion

This study examined student engagement with and perceptions of a course-specific GPT designed to support reflective writing and metacognition without generating assignment text. Survey results suggest that while sustained adoption was limited, a majority of respondents reported at least some engagement (i.e., 62.6% used or tried briefly). Among students who engaged with the tool, perceived helpfulness ratings were generally positive across use types, with the strongest ratings associated with draft feedback on clarity/tone/structure and brainstorming/refining ideas. Students also expressed agreement that the tool supported reflection processes (e.g., structuring reflections, improving clarity) and aligned with course goals related to growth, integrity, and independent thinking. Comparisons by prior AI experience showed weak associations with course-GPT adoption, use frequency, and most perceived outcomes among users, suggesting that extensive prior AI experience was not necessary to engage with or benefit from the tool. However, students reporting higher prior AI use perceived greater value for GPT support related to interpreting course expectations (and, to a lesser extent,

reflection scaffolding) and were more likely to describe their approach to AI for graded reflections as brainstorming/feedback rather than not using AI.

Findings also indicate integrity-related benefits of pairing a constrained reflective GPT with explicit course guidance. Students who used or tried the course GPT were more likely to describe their approach to AI for graded reflections as using AI for brainstorming/feedback rather than not using AI at all, and respondents moderately agreed that both the availability of the GPT and clear AI guidance reduced temptation to misuse AI for reflective writing. Qualitative results showed that the students who engaged with the tool are welcoming of resources learn how to use GPT tools effectively and ethically. They saw the course specific GPT tool as one way to meet this need, and pointed out benefits to learning how to use AI tools in this context as helping them learn the skills to use AI without taking away from other critical learning objectives, such as being able to write effectively and brainstorm diverse ideas.

Taken together, these results suggest that a course-specific, constrained GPT can be perceived as a helpful “coach” for reflective tasks and may reinforce productive norms for AI use when accompanied by clear instructional guidance.

References

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- [3] Sellnow, D. D. “Reflection-AI: exploring the challenges and opportunities of artificial intelligence in higher education,” *Frontiers in Communication*, 2025, <https://doi.org/10.3389/fcomm.2025.1615040>
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Appendix A - Course GPT syllabus statement (as posted in Canvas):

GPT - ME163 - Reflective Guide

This course-specific version of ChatGPT has been customized to support your development as a reflective, independent, and intentional learner. The ME163 - Reflective Guide is designed to help you think more deeply about your experiences in the course and support you in building lifelong learning skills, not to complete your assignments for you.

You can use this GPT for:

- *Clarifying your thoughts by responding to reflective questions*
- *Getting suggestions to improve the organization and clarity of your writing*
- *Identifying textbook chapters relevant to your questions*
- *Practicing metacognitive strategies*
- *Receiving feedback on drafts you've written—not getting them written for you*

You should NOT use this GPT to:

- *Write your reflections or reports for you*
- *Complete your assignments without doing the thinking yourself*
- *Generate answers to quizzes, tests, or textbook questions*

How to use it well:

- *Start with your own rough draft or ideas.*
- *Ask the GPT to help you reflect, deepen, or clarify.*
- *Make thoughtful decisions about what feedback to use.*
- *Submit only work that reflects your own thinking and effort.*

Remember, reflection is where your learning happens. Use this tool to grow, not to bypass growth.

Appendix B – Survey Instrument

Table B1: Survey Instrument

Q#	Item Prompt	Response Option
1	Agreement to voluntarily participate in the research survey	Yes/No
Section A - Background		
2	Prior familiarity with AI tools	5-point Likert scale; not at all...very familiar
3	Before this course, how often did you use AI tools?	Never, Rarely, Sometimes, Often
4	During ME163, did you use the ME163 – Reflective Guide GPT?	Yes / No / I tried it briefly If No → Section D
Section B - Usage		
5	Approximate frequency of using the ME163 GPT	Never, <Monthly, Monthly, Weekly, >Weekly
6	What did you use it for? (check all that apply)	- Clarifying assignment expectations in your own words - Brainstorming/refining ideas for your own reflection - Getting feedback on clarity/tone/structure of your draft - Prompts to deepen reflection/metacognition - Pointers to textbook sections to self-study - Other (free text)
7	How helpful was it for each?	Q6 response options with 5-point Likert scale; Not helpful...Very helpful
Section C - Perceptions & Outcomes		
8	Indicate your agreement.	5-point Likert scale; strongly agree...strongly disagree - The ME163 GPT helped me structure my reflection. - It helped me reflect more deeply on my learning. - It improved the clarity and tone of my writing. - It encouraged me to consult the textbook rather than rely on summaries. - Knowing this GPT was available reduced my temptation to use AI to write my reflection for me. - Clear course guidance about allowed AI use reduced temptation to misuse AI. - In general, AI tools can enhance student learning when used appropriately. - AI tools can make it easier to cheat if misused. - I feel confident I can use AI ethically in my studies. - The ME163 GPT aligns with course goals about growth, integrity, and independent thinking.
Section D - Approach		
9	In ME163, what best describes your approach to AI for graded reflections?	- I did not use AI for graded reflections. - I used AI only for brainstorming or feedback on my draft. - I sometimes used AI to generate text I then edited. - Prefer not to say.
Section E - Experience & Support		
10	Pros and cons you experienced using the ME163 GPT.	Free text
11	What support/resources would help students use AI productively and ethically?	Free text
12	If you did not use the GPT, why not?	I didn't know about it / Didn't see value / Time / Access issues / Prefer other tools / Other [free text]
Section F - Optional Sharing		

Appendix C

Table C1: Mean helpfulness ratings of the ME163 Reflective Guide GPT by use type (1=not helpful, 5=very helpful). Note: Only GPT users who selected a given use type rated its helpfulness. As a result, sample sizes differ across rows. Not applicable responses were excluded from the calculation of means and standard deviations.

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Helpfulness of GPT for clarifying assignment expectations (1=Not helpful ... 5=Very helpful)	48	1.00	5.00	3.9375	1.03977
Helpfulness of GPT for brainstorming/refining ideas (1=Not helpful ... 5=Very helpful)	56	1.00	5.00	4.0536	.92283
Helpfulness of GPT for feedback on clarity/tone/structure (1=Not helpful ... 5=Very helpful)	54	1.00	5.00	4.0926	.93705
Helpfulness of GPT for reflection/metacognition prompts (1=Not helpful ... 5=Very helpful)	47	1.00	5.00	3.7021	1.04080
Helpfulness of GPT for pointers to textbook sections (1=Not helpful ... 5=Very helpful)	43	1.00	5.00	3.7674	1.19198
Valid N (listwise)	29				

Table C2: Student agreement with statements related to the perceived impact, ethics, and alignment of the ME163 Reflective Guide GPT (1=strongly disagree, 5=strongly agree). Note: Only respondents who indicated at least some use of the ME163 Reflective Guide GPT completed these items; therefore, sample sizes vary slightly across statements. Means and standard deviations were calculated excluding missing responses.

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
ME163 GPT helped me structure my reflection (1=SD ... 5=SA)	73	2.00	5.00	3.7123	.67658
It helped me reflect more deeply on my learning (1=SD ... 5=SA)	74	2.00	5.00	3.4865	.76289
It improved the clarity and tone of my writing (1=SD ... 5=SA)	72	2.00	5.00	3.6250	.73996
It encouraged me to consult the textbook rather than rely on summaries (1=SD ... 5=SA)	74	2.00	5.00	3.5405	.83073
Knowing this GPT was available reduced my temptation to use AI to write my reflection (1=SD ... 5=SA)	74	2.00	5.00	3.7297	.83251
Clear course guidance about allowed AI use reduced temptation to misuse AI (1=SD ... 5=SA)	74	2.00	5.00	3.8378	.74073
In general, AI tools can enhance student learning when used appropriately (1=SD ... 5=SA)	73	3.00	5.00	4.3699	.63480
AI tools can make it easier to cheat if misused (1=SD ... 5=SA)	75	2.00	5.00	4.1067	.72733
I feel confident I can use AI ethically in my studies (1=SD ... 5=SA)	75	2.00	5.00	4.1733	.74204
The ME163 GPT aligns with course goals about growth, integrity, and independent thinking (1=SD ... 5=SA)	75	2.00	5.00	3.9467	.69542
Valid N (listwise)	70				