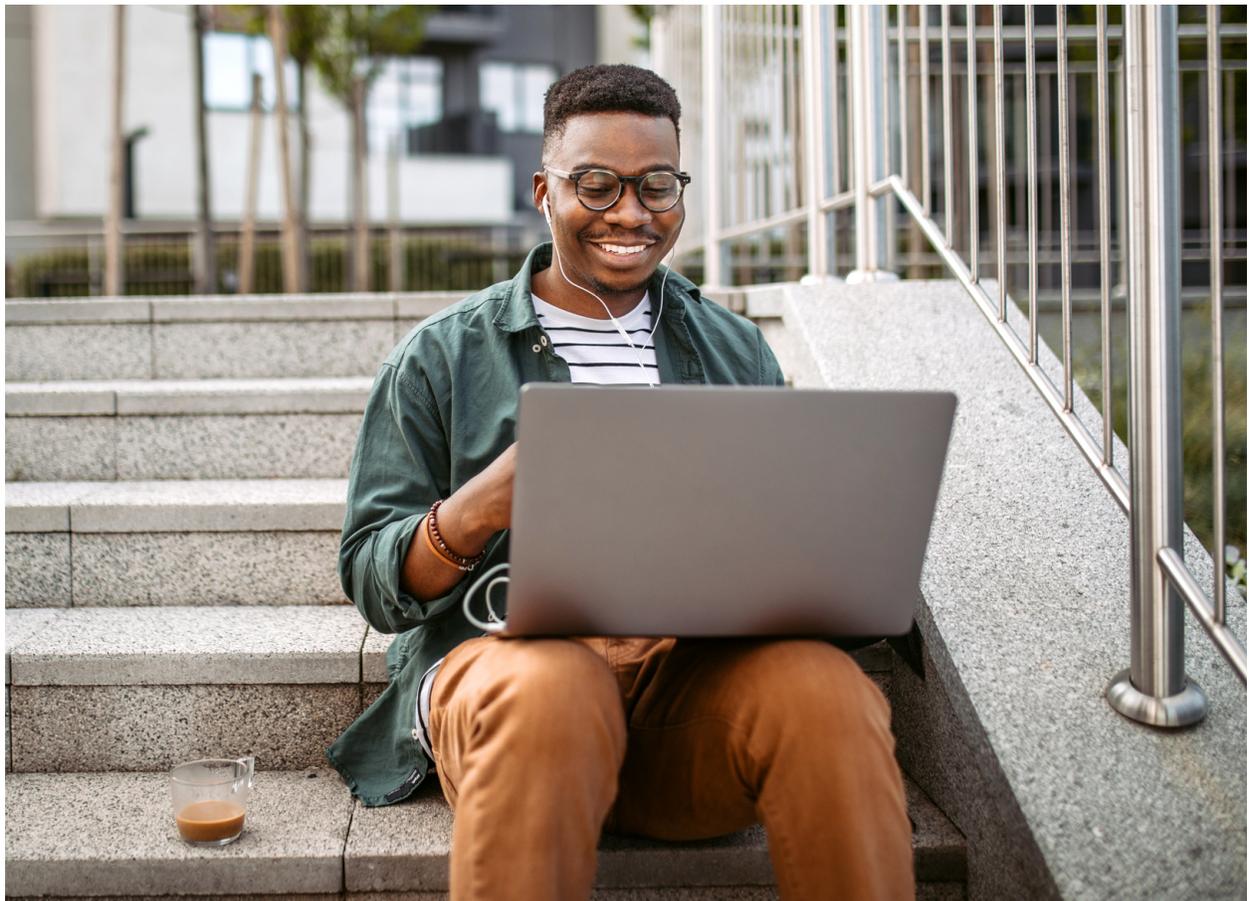


# High School Students' Use and Impressions of AI Tools

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**ACT**<sup>®</sup>

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## Summary

There is growing interest in artificial intelligence (AI) tools, especially high-profile tools like ChatGPT, and these tools now appear to be part of the education experience for many high school students. Using data from a nationwide sample of students in Grades 10 through 12, this study examined students' use of AI tools for school assignments and other purposes, their impressions of how using the tools might affect them cognitively and academically, and their thoughts on using AI tools to write their college admissions essays.

### Key findings from the study include the following

- ➔ Almost half of the participating high school students reported that they had used AI tools, the most common being ChatGPT. Among the 54% of students who reported not using AI tools, the top reason for not using them was no interest (83%), followed by not trusting the information they provide (64%) and not knowing enough about them (55%).
- ➔ Almost half of the students who had used AI tools reported using them for school assignments. The tools were most often used for language arts (writing) and social studies assignments. Students also used AI tools for purposes other than school assignments, including for entertainment or hobbies and to get personalized recommendations.
- ➔ Students with higher academic performance were significantly more likely to use AI tools than were students with lower academic performance.
- ➔ Nearly three fourths (74%) of students believed that their overall performance in school would improve at least a small amount because of using AI tools for school assignments.
- ➔ Nine out of ten participating students reported that they had *not* considered using AI tools to write their college admissions essays. One reason students reported not using AI tools for this purpose was their belief that current AI tools have limitations and cannot yet generate high-quality, personalized, original, and authentic college admissions essays that reflect students' skills, abilities, and unique writing styles. Students also believed that using AI tools to write their college admissions essays would be dishonest and unethical, and they wanted the sense of accomplishment that would come from writing their essays.



## Introduction

As a rapidly evolving technology, artificial intelligence has been widely used in various domains of education, including teaching, learning, assessment, and administration (Chiu et al., 2023). More recently, generative AI tools have been advancing quickly. These tools are built upon large language models (LLMs) that allow them to identify and predict patterns in large datasets; the tools can then generate new content or outputs such as text and images (ISTE, 2023). One example of these generative AI tools is ChatGPT. By March 2023, ChatGPT had already been publicly available as a large language-based artificially intelligent chatbot for a few months and was receiving considerable attention in education. Some attention was negative: ChatGPT was banned by some of the largest school districts in the U.S. because of concerns over potential academic dishonesty on the part of students (see, for example, Jimenez, 2023). Other reactions were positive: One survey, for example, reported that 88% of teachers and 79% of students who had used ChatGPT believed it had positively affected teaching and learning (Impact Research, 2023a). In addition, ChatGPT's potential for writing college admissions essays was noticed soon after the tool's emergence, with one K–12 and higher education author stating that “not only does ChatGPT write clear essays, but it can also conjure up its own personal details and embellishments that could up a students’ *[sic]* chance of acceptance and would be difficult to verify” (Whitford, 2022).

There is growing interest in AI tools, especially high-profile tools like ChatGPT. For example, a July 2023 survey found that ChatGPT was familiar to and viewed favorably by a majority of students (ages 12–18), parents, and teachers (Impact Research, 2023b). AI tools now appear to be part of the education experience for many high school students, but how are students using them, and what do they think about them? By collecting students' perceptions of AI tools and learning how students use them, we not only gain a new understanding of students' experiences but are better able to assist students, their families, and educators as students progress through high school and prepare for college or career. For example, a perception on the part of students that using AI tools will increase their creativity could influence the kinds of school assignments that teachers develop and how they integrate AI tools into those assignments. As another example, an observed positive relationship between students' AI tool use and their academic achievement could indicate a need for educational supports (e.g., assistance with accessing AI tools) for lower-achieving students.

To investigate students' use and impressions of AI tools, we developed a survey in June 2023, which was administered to a large nationwide sample of students in Grades 10 through 12. The survey instrument had questions about whether students used AI tools and, if not, why not; which tools they used; whether they used AI tools for school assignments and, if so, how often; courses and subjects in which students used AI tools; and the tools' potential effects on creativity, persistence, critical thinking, and overall school performance. Additionally, the survey instrument asked students whether they believed that AI tools should be banned on school-owned networks and devices and whether they had considered using AI tools to write their college admissions essays. A detailed description of the survey instrument is provided in the technical appendix (pp. 31–37). In this report, we share what we learned from a total of 4,006 high school students.



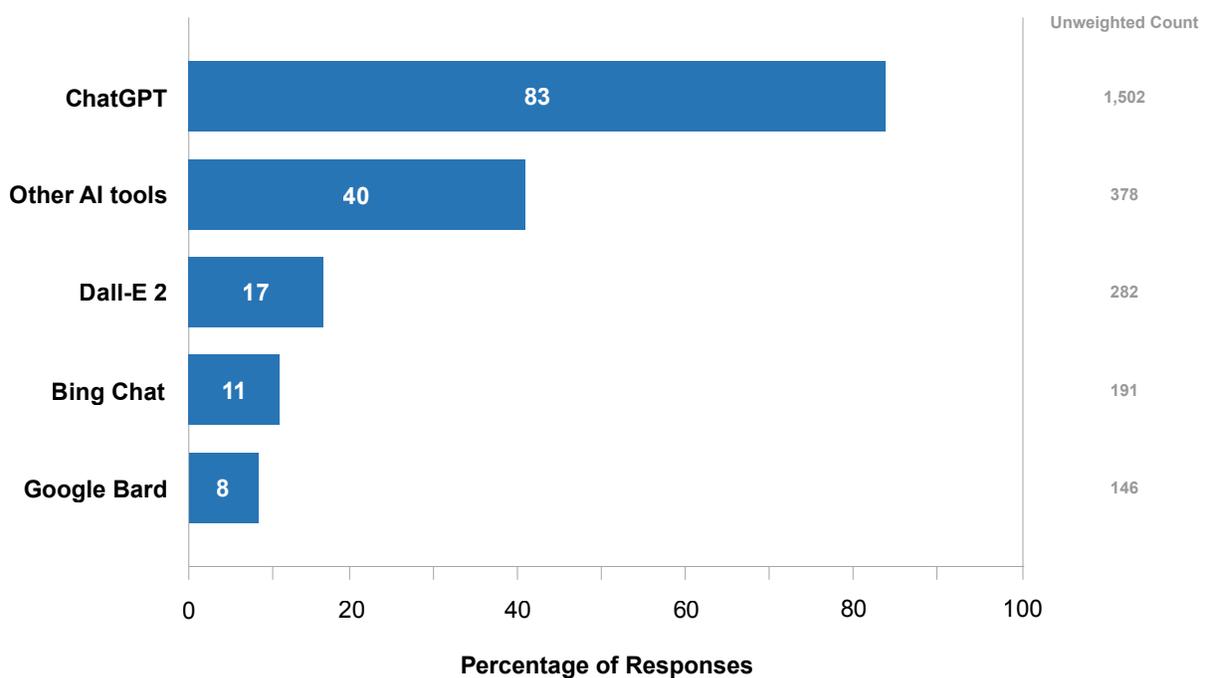
## Findings

### To What Extent Do Students Use AI Tools?

#### Overall AI Tool Use

Slightly less than half (46%) of students reported that they had used AI tools. The tools they most often used were ChatGPT (used by 83% of students), Dall-E 2 (17%), and Bing Chat (11%; see Figure 1). Forty percent of students reported that they had used other AI tools. Other tools that students mentioned most often in written responses included My AI on Snapchat, Grammarly, and Midjourney.

**Figure 1.** AI Tools Used by Students

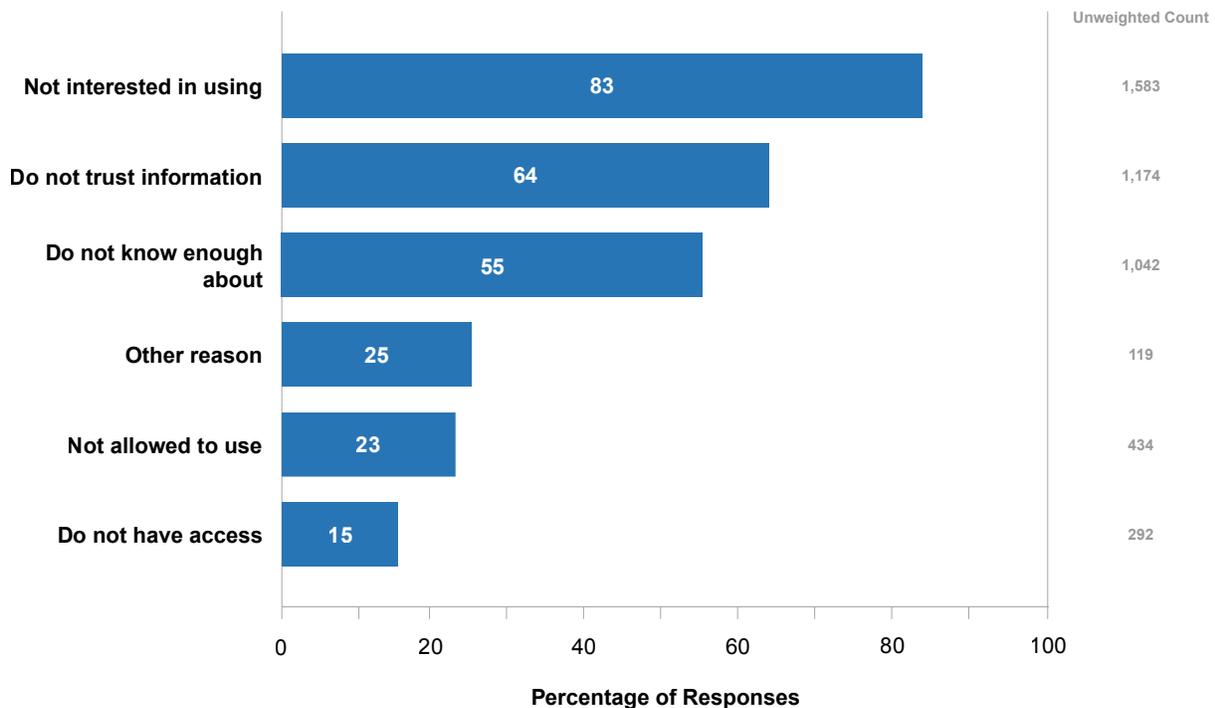


*Note.* Each student could indicate one or more tools used. The sum of the percentages in this figure will therefore exceed 100%.



Although AI tool use was prevalent among the students in this study, slightly more than half (54%) reported that they had *not* used AI tools. The main reasons for not using AI tools included a lack of interest in them (83%), not trusting the information they provide (64%), and not knowing enough about them (55%; Figure 2). Other reasons for not using AI tools, based on students' written responses, included considering the use of AI tools immoral or unethical, viewing the content or information provided by AI tools as inaccurate, and being willing to do the work without resorting to AI tools.

**Figure 2.** Reasons for Not Using AI Tools



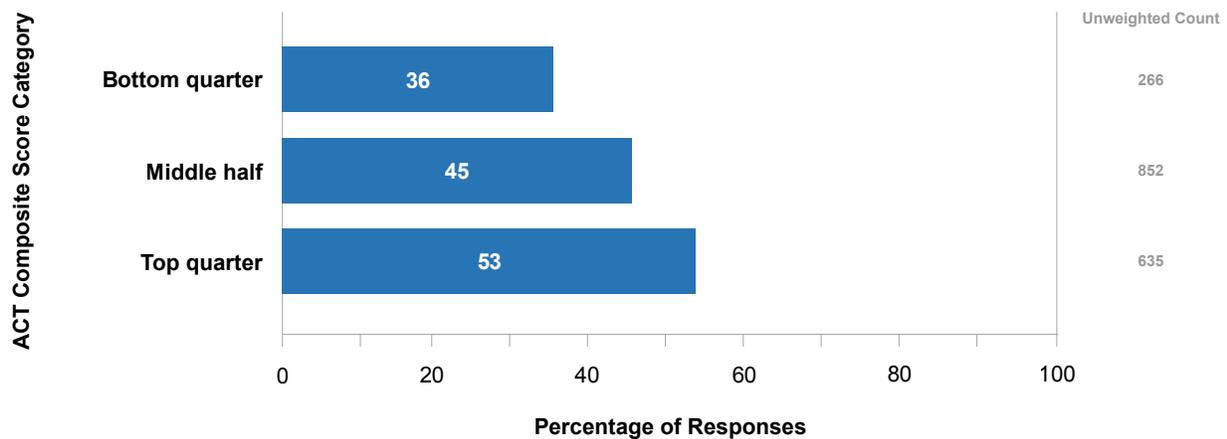
*Note.* Each student could indicate one or more reasons for not using AI tools. The sum of the percentages in this figure will therefore exceed 100%.

### AI Tool Use at Different Levels of Academic Achievement

We examined the relationship between students' academic achievement (as measured by ACT Composite scores) and AI tool use. We categorized the students into three groups based on whether their ACT Composite scores were in approximately the top quarter of the distribution of Composite scores among survey respondents, in the middle half, or in the bottom quarter. Our analysis revealed that AI tool use was significantly related to students' academic achievement level ( $X^2 = 44.69, p < .0001$ ). Students with higher Composite scores (i.e., in the top quarter) were more likely to use AI tools than those with lower scores. As shown in Figure 3, 53% of students with Composite scores in the top quarter used AI tools, compared with 36% of those in the bottom quarter (ES = 0.34).<sup>1</sup>

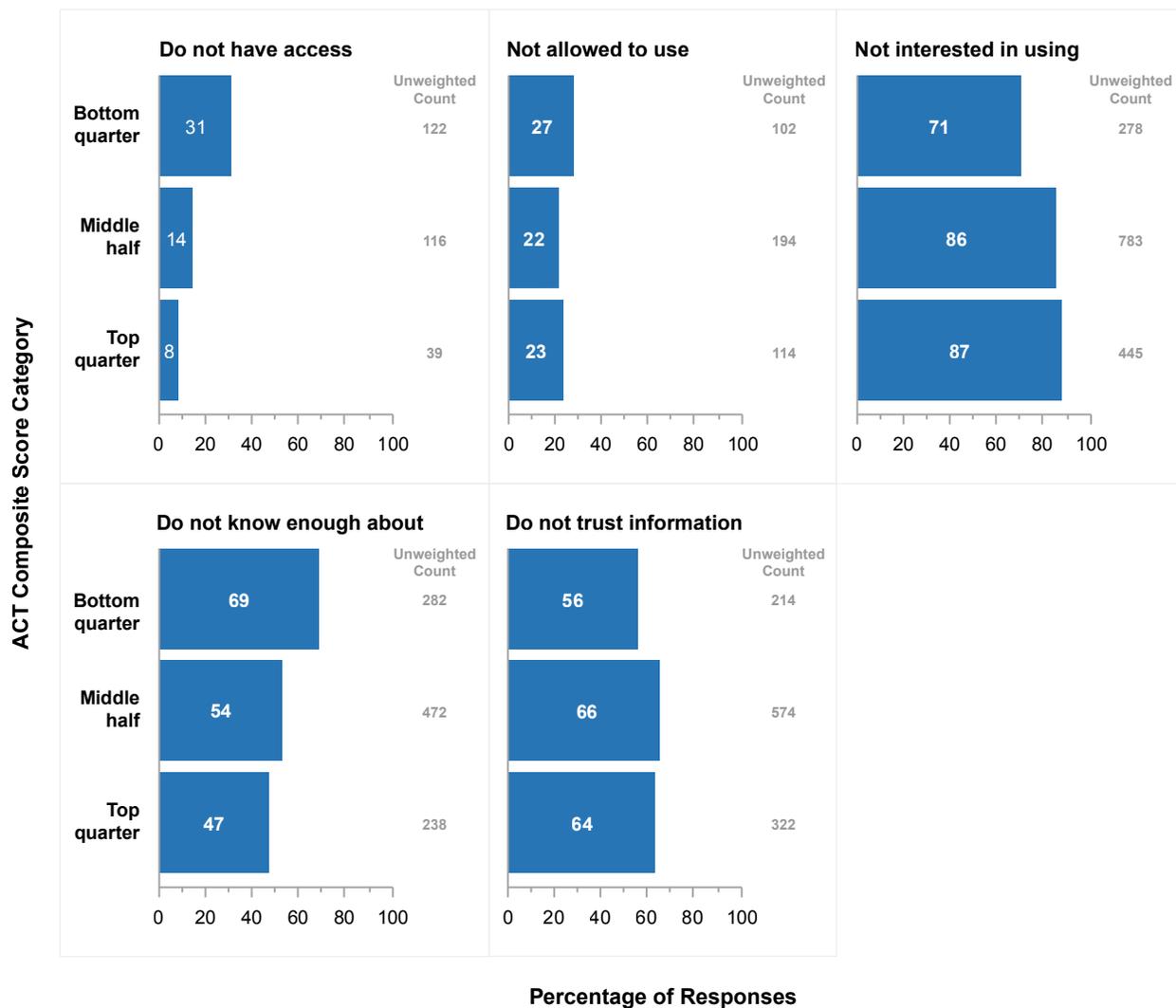


**Figure 3.** AI Tool Use, by ACT Composite Score Category



Among students who did not use AI tools, significant differences in the reasons for not using them were observed across ACT Composite score categories (Figure 4). Statistically significant  $\chi^2$  values ranged from 9.96 ( $p < .01$ ) for “do not trust information” to 76.42 ( $p < .0001$ ) for “do not have access.” The Composite score category and AI tool relationship for “not allowed to use AI tools” was not statistically significant. Considerably larger percentages of students with Composite scores in the bottom quarter, compared with students in the top quarter, reported that they did not use AI tools because they did not have access to them (31% vs. 8%, respectively; ES = 0.61) and/or did not know enough about them (69% vs. 47%, respectively; ES = 0.44). Students with scores in the top quarter were noticeably more likely than those with scores in the bottom quarter to report that they were not interested in using AI tools (87% vs. 71%, respectively; ES = 0.41).

**Figure 4.** Reasons for Not Using AI Tools, by ACT Composite Score Category

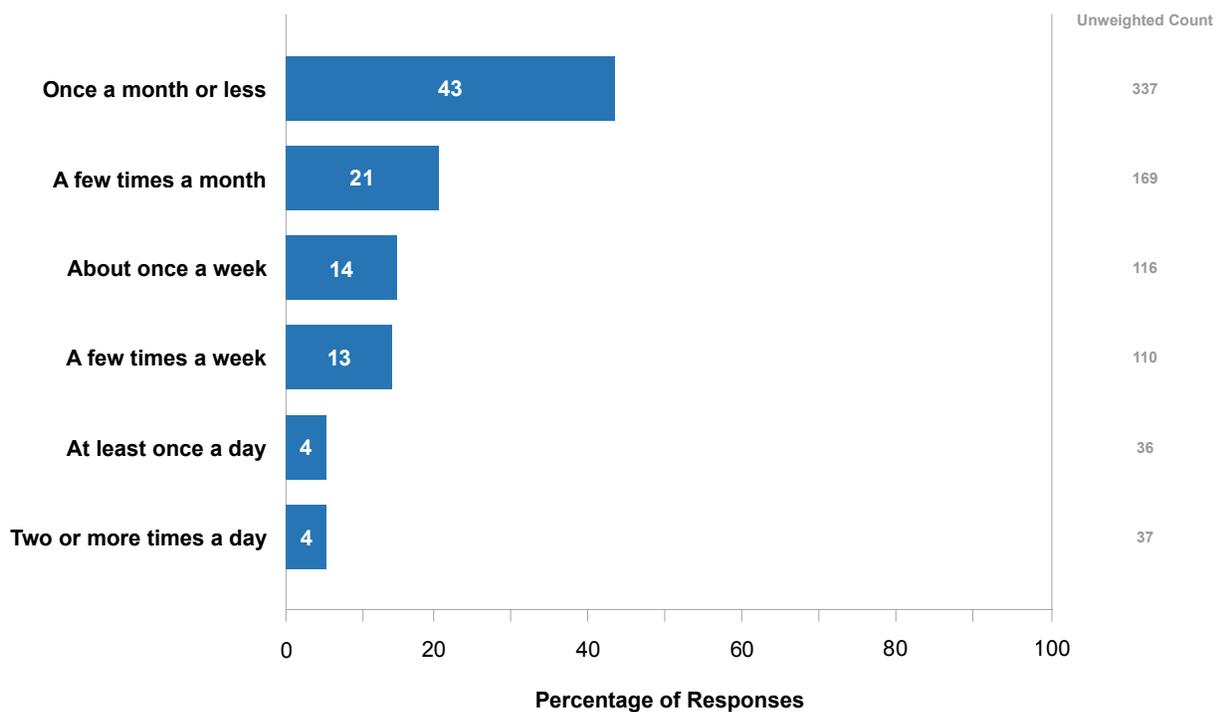


## For What Purposes Do Students Use AI Tools?

### ***AI Tool Use for School Assignments***

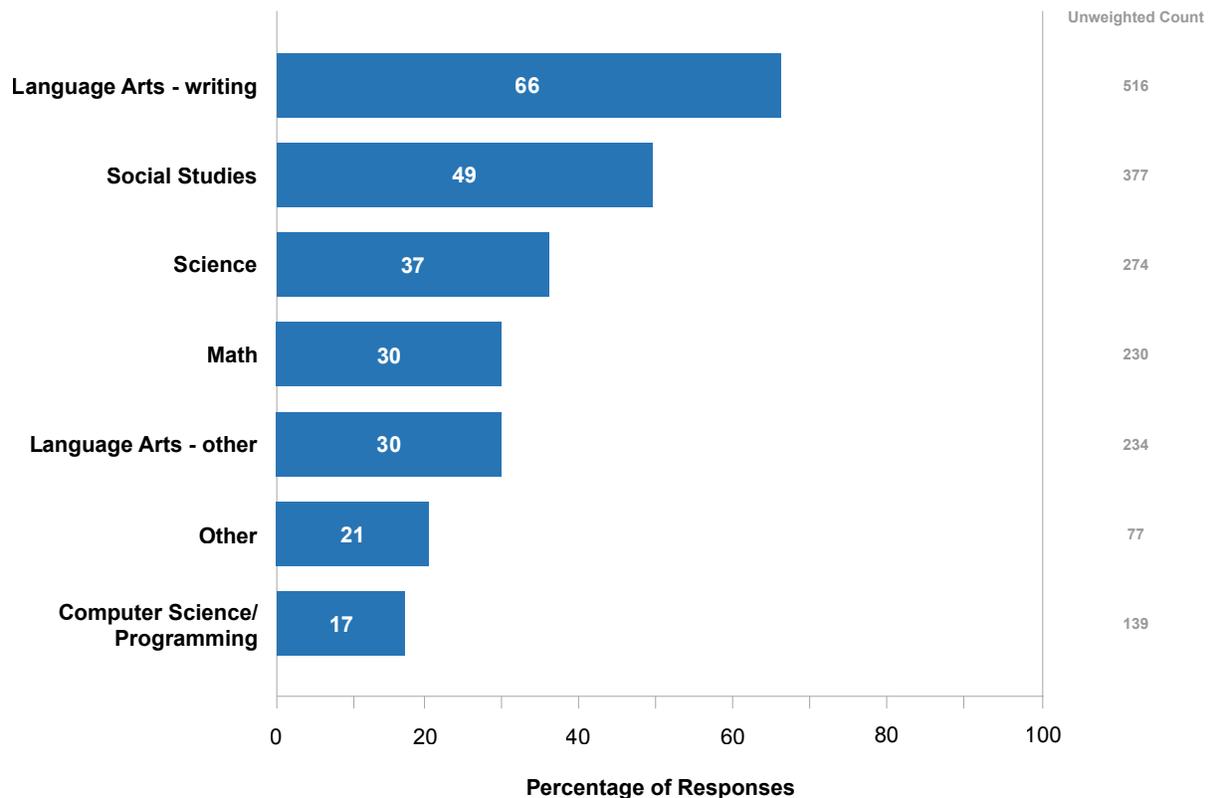
Among students who used AI tools, almost half (46%) reported that they had used these tools for school assignments. Frequency of use varied, with most students (64%) reporting that they used AI tools a few times a month or less for school assignments. Another 27% reported using these tools once or a few times a week, and 8% reported using them once a day or more (Figure 5).

**Figure 5.** How Often Students Used AI Tools for School Assignments



Students' AI tool use varied across courses, ranging from 66% in writing-related language arts courses to 17% in computer science/programming (Figure 6). Twenty-one percent of students reported using AI tools in courses other than those listed on the survey instrument. These courses included arts (e.g., art, drama, music) and foreign languages, among others.

**Figure 6.** Courses in Which AI Tools Were Used



*Note.* Each student could indicate one or more courses in which AI tools were used. The sum of the percentages in this figure will therefore exceed 100%.

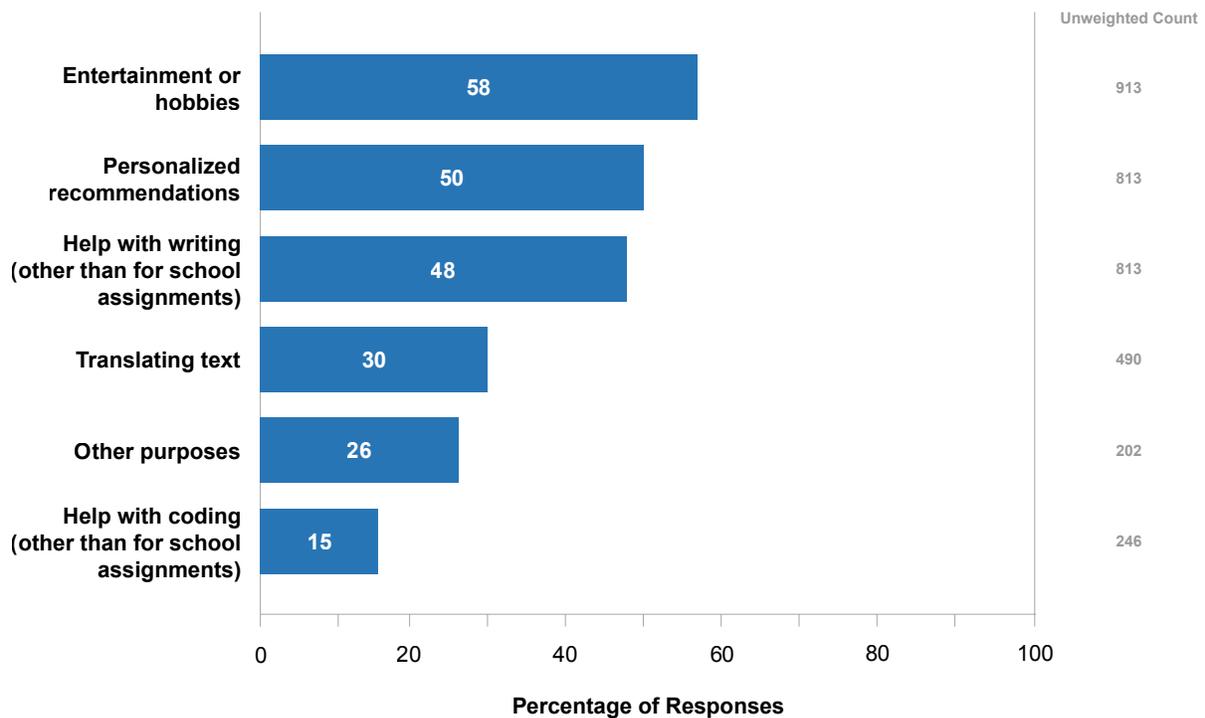
### Accuracy of AI Tools for School Assignments

Students were also asked if they had found errors or incorrect information in the responses generated by AI tools when using them for school assignments. A majority (63%) indicated that they had. A statistically significant relationship between students' academic achievement level and finding errors in AI tools was observed ( $X^2 = 16.74$ ,  $p < .001$ ), with noticeably more students in the top score category reporting that they had found errors compared with students in the bottom score category (73% vs. 48%, respectively;  $ES = 0.52$ ).

### AI Tool Use for Other Purposes

Students were asked whether they had used AI tools for purposes other than school assignments. Students reported primarily using the tools for entertainment or to get help with hobbies such as creating art and graphics or writing songs or poetry (58% of students reported this use); they also used the tools to seek personalized recommendations for things such as movies and products (50%) and to get help with non-school writing projects (48%; Figure 7). In their written responses, students also mentioned using AI tools to search for information, learn about topics of interest, and get advice.

**Figure 7. Purposes for Which AI Tools Were Used**



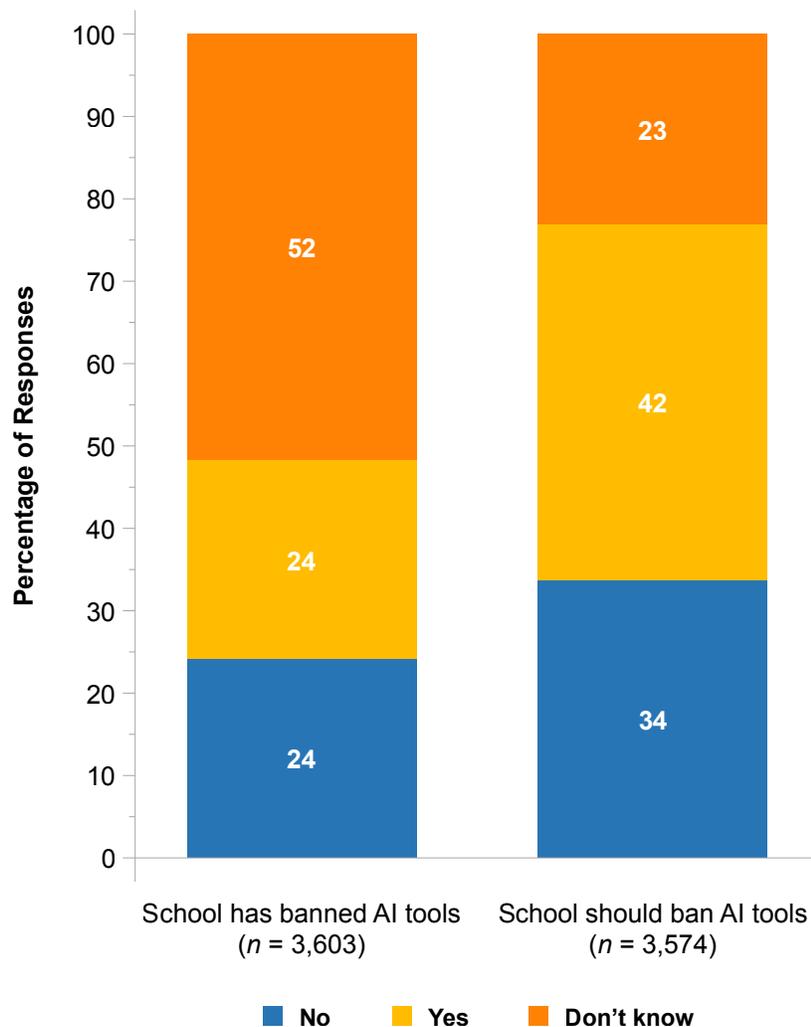
*Note.* Each student could indicate one or more purposes for which AI tools were used. The sum of the percentages in this figure will therefore exceed 100%.

## What Do Schools Think About the Use of AI Tools?

### ***Banning AI Tools on School-Owned Networks and Devices***

Although approximately one fourth (24%) of students reported that their schools had banned AI tools on school-owned networks and devices, a majority (52%) did not know if this was the case at their schools. When asked if their schools should ban AI tools on school-owned networks and devices, 42% of the students indicated “yes,” 34% indicated “no,” and nearly one fourth (23%) indicated that they did not know whether this should be done (Figure 8).

**Figure 8.** Banning AI Tools on School-Owned Networks and Devices



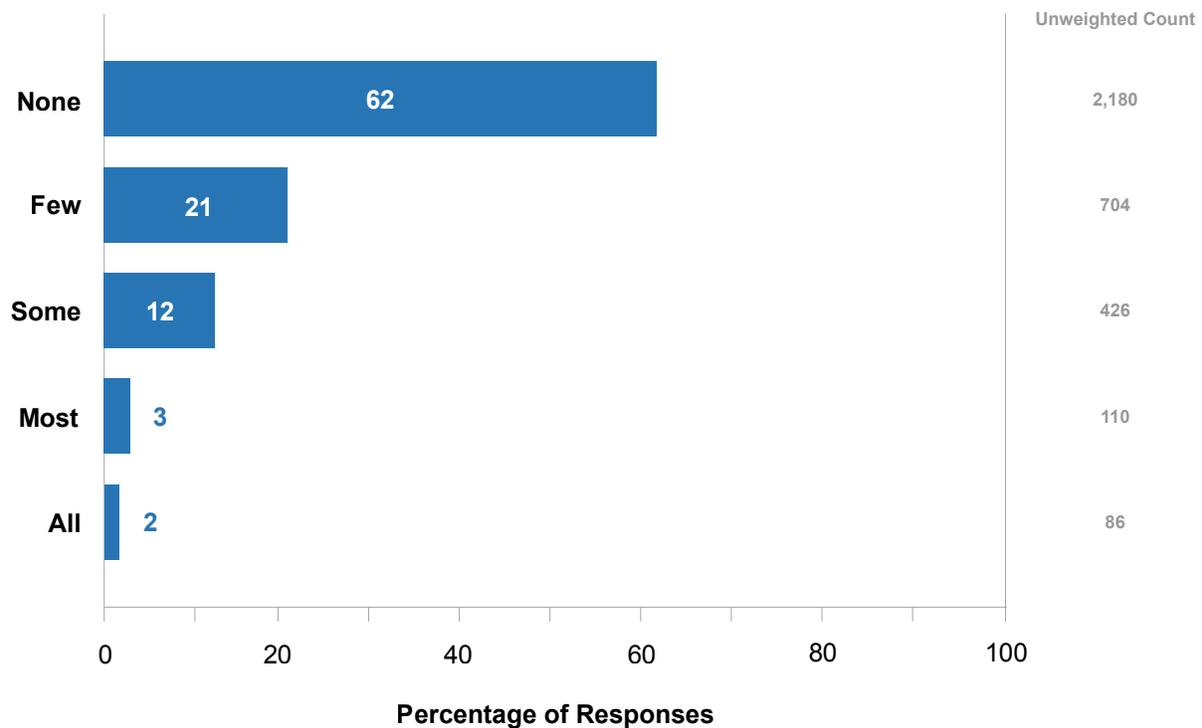
*Note.* Due to rounding, the sum of the percentages in each bar in this figure might not equal 100%.

Students’ opinions about banning AI tools on school-owned networks and devices were significantly related to their ACT Composite score category ( $X^2 = 31.72, p < .0001$ ). Students with Composite scores in the bottom quarter were more likely than those with scores in the top quarter to report that schools should ban AI tools (61% vs. 47%, respectively; ES = 0.30).

### **Allowing Students to Use AI Tools for School Assignments**

Although students used AI tools for school assignments, not all their teachers supported this practice. A majority (62%) of students reported that none of their teachers allowed students to use AI tools for school assignments, while 17% reported that at least some of their teachers allowed it (Figure 9).

**Figure 9.** How Many Teachers Allowed Students to Use AI Tools for School Assignments?



### **How Do Students Think the Use of AI Tools Will Affect Them?**

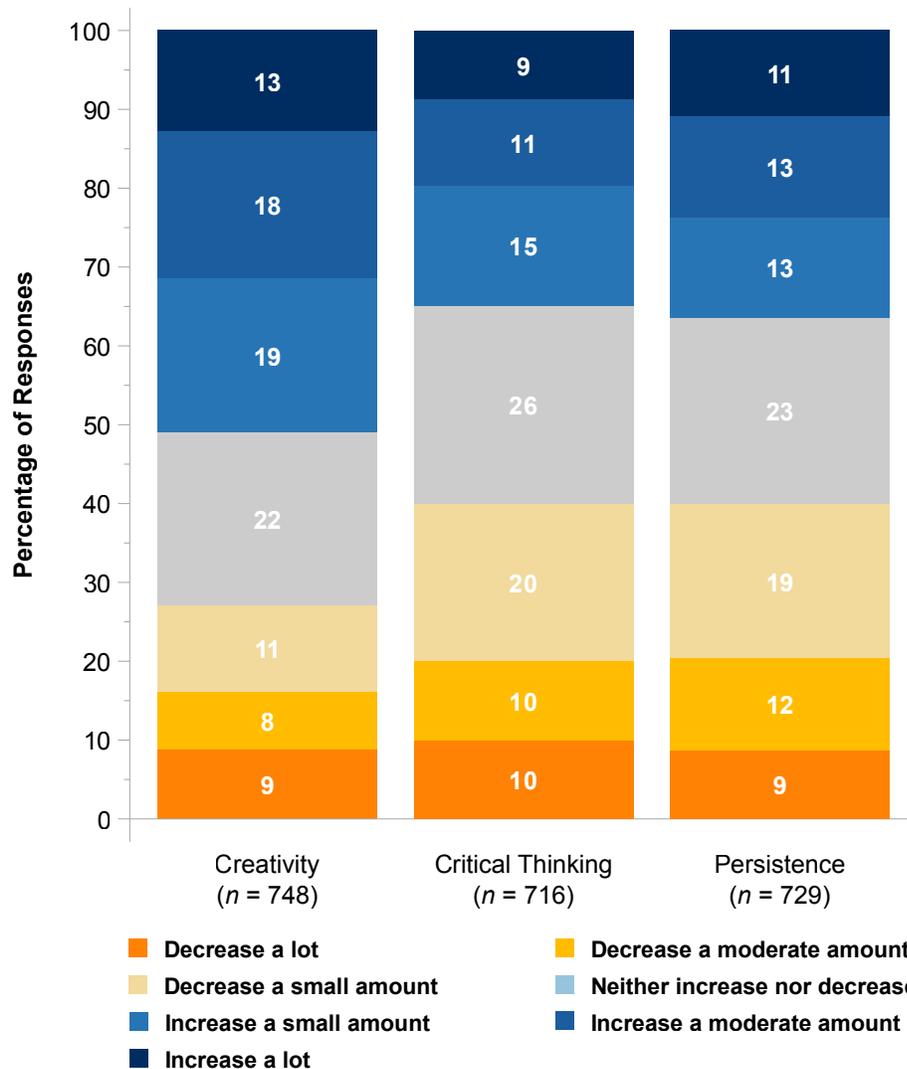
#### ***Cognitive and Behavioral Effects***

Students were provided with definitions of creativity, critical thinking, and persistence, each of which is tied to ACT's Holistic Framework<sup>®</sup>, which describes knowledge and skills needed for success in school and work (Camara et al., 2015). The definitions are as follows:

- ***Creativity***—Generating original ideas, using existing ideas in new ways, and having an active imagination
- ***Critical thinking***—Ability to analyze, evaluate, synthesize, and expand information
- ***Persistence***—Working hard, making progress on relevant tasks, and maintaining focus despite setbacks or difficulties

Students were then asked to what extent they believed their creativity, critical thinking, and persistence would increase or decrease because of using AI tools for school assignments. Half of students (50%) believed their creativity would increase because of using AI tools for school assignments, while around one quarter (28%) believed it would decrease. As illustrated in Figure 10, however, different patterns were observed for critical thinking and persistence; somewhat more students believed these characteristics would decrease than believed they would increase (critical thinking: 40% vs. 35%, respectively; persistence: 40% vs. 37%, respectively).

**Figure 10.** Perceived Cognitive and Behavioral Impacts of Using AI Tools for School Assignments



*Note.* Due to rounding, the sum of the percentages in each bar in this figure might not equal 100%.

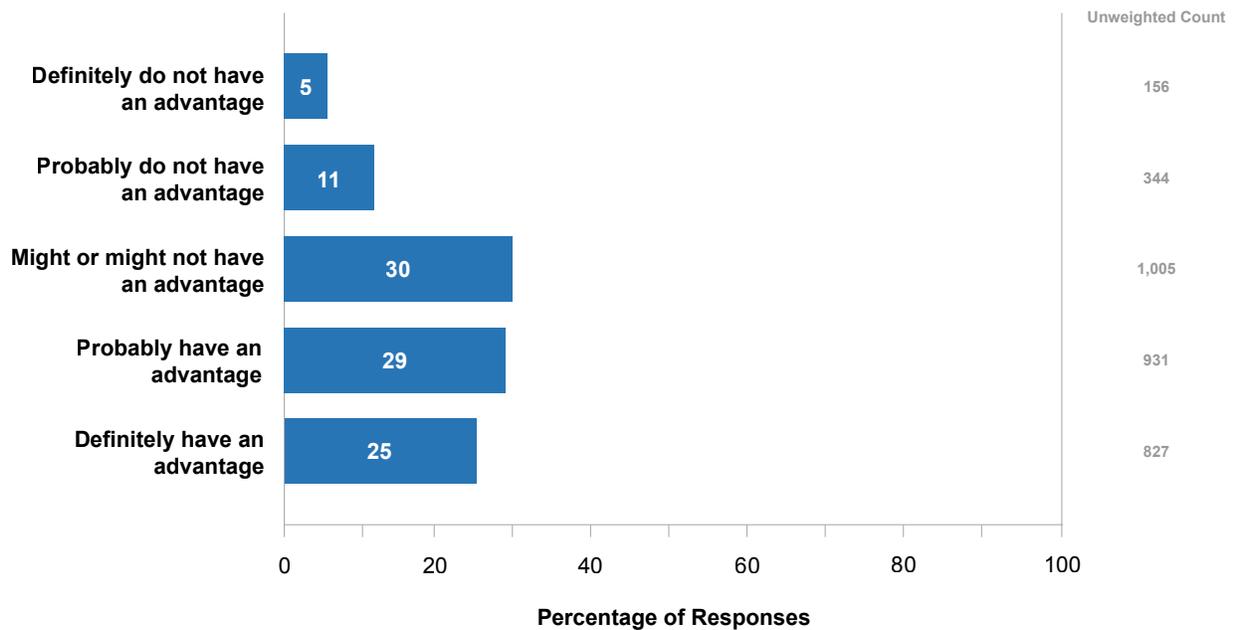
Students with ACT Composite scores in the bottom quarter gave higher ratings, on average, of the extent to which their persistence would increase because of using AI tools than did students with scores in the middle half (means of 4.64 and 3.76, respectively, on a scale where 1 = decrease a lot and 7 = increase a lot;  $q = 3.81, p < .001, ES = 0.51$ ). Somewhat similar findings were observed for ratings of critical thinking, with students whose Composite scores were in the bottom quarter giving higher average ratings of the extent to which their critical thinking would increase than students whose scores were in the middle half (means of 4.42 and 3.76, respectively;  $q = 2.97, p < .01, ES = 0.39$ ).

**Academic Effects**

Students were asked if they thought that students who use AI tools for school assignments have an advantage over those who do not use them. One quarter (25%) believed that students who use AI tools for school assignments definitely have an advantage, and another 29% believed that such students probably have an advantage. Nearly one third (30%) believed that such students might or might not have an advantage. Nearly one third (30%) believed that such students might or might not have an advantage (Figure 11).

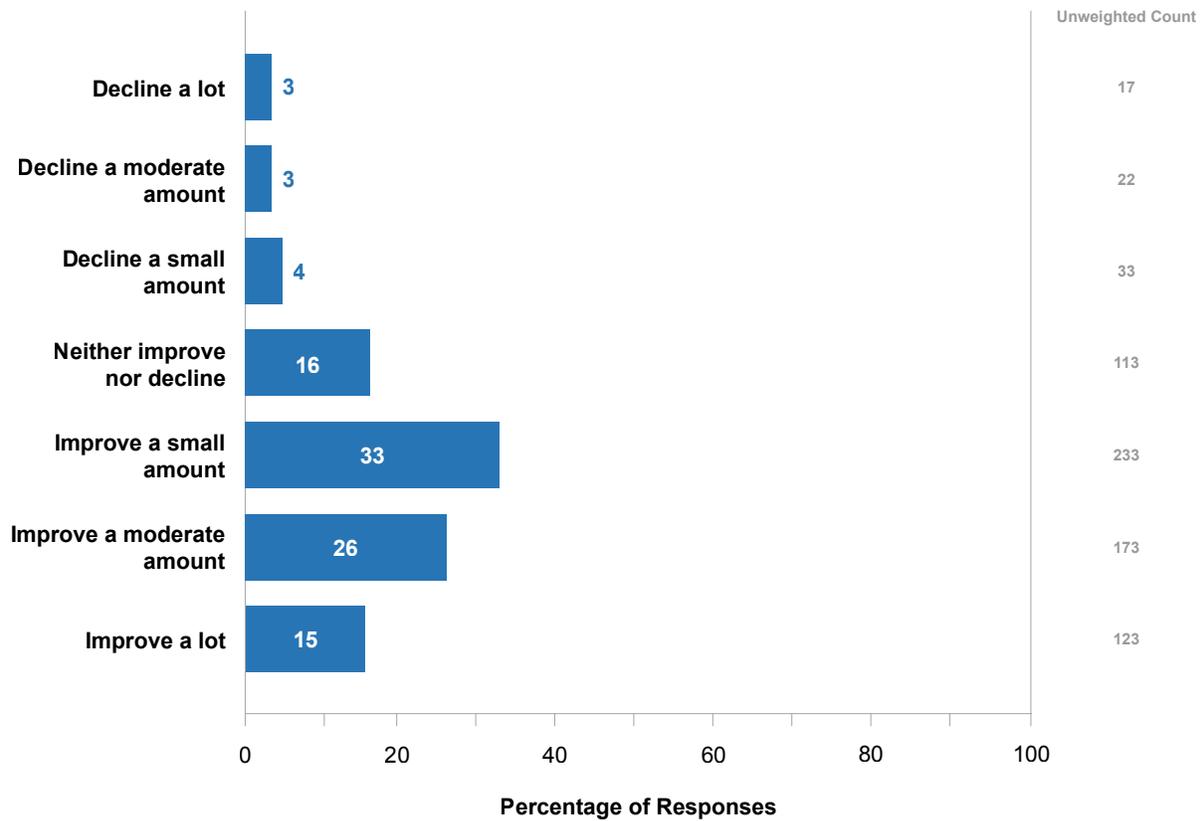


**Figure 11.** Perspectives on Whether Students Who Use AI Tools for School Assignments Have an Advantage Over Students Who Do Not



Despite students' reports of anticipated decreases in critical thinking and persistence because of using AI tools for school assignments, nearly three fourths (74%) believed that their overall performance in school would improve at least a small amount because of using AI tools for this purpose. A relatively small percentage (10%) believed that their overall performance in school would decline at least a small amount (Figure 12).

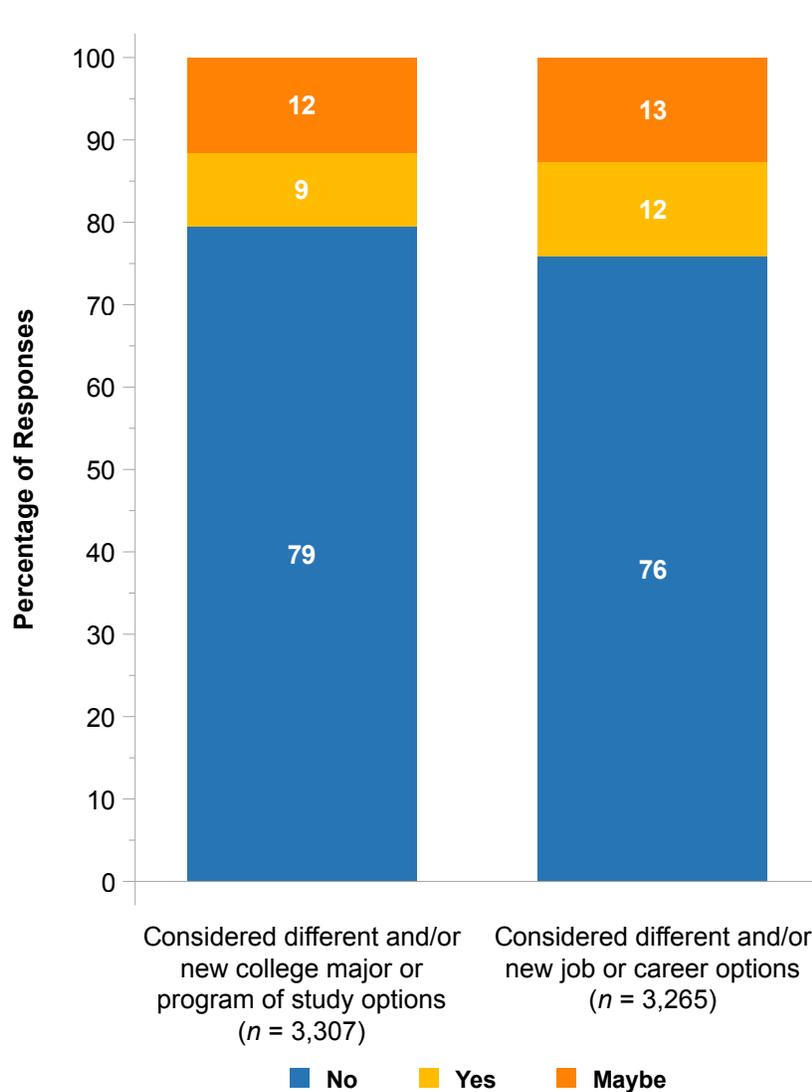
**Figure 12.** Perceived Improvement or Decline in Overall School Performance as a Result of Using AI Tools for School Assignments



### College Major and Career Choices

A majority of students (79%) reported that the emergence of AI tools had *not* caused them to consider different and/or new options for their college major or program of study. A similar percentage (76%) reported that the emergence of these tools had *not* caused them to consider different and/or new options for future job or career plans (Figure 13).

**Figure 13.** Perceived Impacts on College Major and Career Choices Resulting From the Emergence of AI Tools



*Note.* Due to rounding, the sum of the percentages in each bar in this figure might not equal 100%.

## What Are Students’ Perceptions of Using AI Tools for College Admissions Essays?

Most (90%) of the surveyed students reported that they had *not* considered using AI tools to write their college admissions essays, while only 10% said that they had considered using AI tools for this purpose.

Students with ACT Composite scores in the bottom quarter were noticeably more likely to report that they had considered using AI tools for college admissions essays compared to students with scores in the top quarter (13% vs. 6%, respectively, ES = 0.26; overall  $X^2 = 80.73, p < .0001$ ).

In an open-ended question, we asked students to explain why they had or had not considered using AI tools to write their college admissions essays. By analyzing the responses from 2,690 students<sup>2</sup>, we learned that students had a range of positive and negative thoughts about the use of AI tools for these important essays.

Table 1 ranks the top four reasons (229 responses) why students considered using AI tools when writing their essays. These student-identified reasons are described below.

**Table 1.** Top Reasons for Using AI Tools for College Admissions Essays (by rank order)

Essay grammar and sentence composition ( <i>n</i> = 102)
Idea generation ( <i>n</i> = 56)
Essay structure ( <i>n</i> = 41)
Convenience ( <i>n</i> = 30)

### ***Essay Grammar and Sentence Composition***

There were students who considered using AI tools to help them with the mechanics and conventions of writing, such as spelling, grammar, and composition. These students thought this type of AI feedback would help them better articulate the information they wanted to share and improve the quality of their college admissions essays. Two students indicated the following (note that all student quotes are reproduced as written and without editing):

- “I believe it would help me be more descriptive about stuff that I want to say and make me seem more professional.”*
- “Probably would use for feedback, see what grammar/punctuation choices it makes. Also if I need quick synonyms or help writing an idea in my head that I can’t write down.”*

### **Idea Generation**

Some students also thought AI tools would be a good source of inspiration and creativity. These tools were considered a starting point for brainstorming essay topics. In addition, students considered using AI tools to identify different ways to expound on these topics. Two students remarked as follows:

*“I use AI tools in order to get past a writers block, usually as another entity to bounce ideas off and gain inspiration the same as I have done with peers in the past.”*

*“It would help give me ideas of how to explain things and stuff to write about.”*

### **Essay Structure**

There were also students who focused on how AI tools could be useful for structuring college admissions essays. For these students, AI tools were considered useful for outlining essays and providing a foundation from which the student could expand the essay content. Further, AI tools could help with organizing the material, focusing on what is important, and making connections between ideas. Here are the words of three students:

*“AI would be more of a guideline or outline draft for my final college admission essay.”*

*“Because is very helpful when organizing what you have to write down on paper.”*

*“AI tools will help bring creativity and connections to my essay.”*

### **Convenience**

Other students considered AI tools potentially helpful when it came to actually writing their college admissions essay. They thought using AI tools for this work would be easy, save time, and reduce their workload, as shown in these comments from two students:

*“It would be easy and neat. I would be able to say everything I wanted to say quicker, faster, and easier.”*

*“It’s easier and I wouldn’t have to write out the whole essay.”*

One student’s comment even anticipated that AI tools would be helpful in the future:

*“These tools will be a great help for my future work or college, I will be able to work more efficiently without any problems because of AI.”*

Students who considered using AI tools to write their college admissions essays offered a number of reasons why they thought these tools would be beneficial. At the same time, students who chose not to use these tools for this purpose provided several reasons for this perspective. Two themes emerged from their responses. First, students thought the AI tools had some writing limitations and were not able to generate a satisfactory essay. Second, students were concerned about the consequences of using AI tools. Tables 2 and 3 rank the top reasons (3,424 responses) related to these two themes. Table 2 ranks the top five reasons related to writing essays, and Table 3 ranks the top five reasons related to the results of using AI tools when developing essays. These student-identified reasons are described below.

**Table 2.** Top Writing-Related Reasons for Not Using AI Tools for College Admissions Essays (by rank order)

Personalized writing ( $n = 792$ )
Original and authentic writing ( $n = 568$ )
Imperfect essay quality ( $n = 417$ )
Reflection of skills and abilities ( $n = 314$ )
Unique writing style ( $n = 112$ )

### **Personalized Writing**

Many students considered AI tools incapable of generating personalized college admissions essays—that is, essays that reflect a student’s personality or convey a student’s life experiences. For these students, AI tools would not be able to capture who they are as people in a personal way. This personal touch is reserved for humans and not AI tools, as indicated by students in the following comments:

*“AI doesn’t have experiences, college essays require personal experience that AI lacks.”*

*“AI cannot capture one’s personality the way a human can.”*

*“I believe that AI’s don’t know myself more than I do, I would rather my college essay be personalized which cannot be accomplished by an AI.”*

*“Since most AI tools take other things and put them together in new ways. because of this, I see no way this tech is able to make a personalized and emotional perspective based on my life specifically.”*

### **Original and Authentic Writing**

There were also students who did not consider using AI tools because the results would not represent their own work. For them, college admissions essays generated by these tools would be developed based on the writing of others and would not be original work developed by the students themselves. Additionally, students wanted their essays to be as authentic and genuine as possible, and they thought this genuineness would be lacking if they used AI tools. This is highlighted by three students:

*“Nothing written by AI is original work and is not a reflection of the person who claims to be a work’s ‘creator.’ ”*

*“Because I want my college essays to be as genuine and heartfelt as possible only I would be able to truly do that.”*

*“Because the essay is supposed to be authentically me, authentically human- and authentic can’t come from auto generation or other such methods. Real people can tell when what’s in front of them isn’t truly real.”*



### **Imperfect Essay Quality**

Some students did not consider writing their college admissions essays using AI tools because the tools would not produce high-quality essays. These students described AI-generated essays as vague, superficial, lacking in detail, uninteresting, and not emotionally expressive. They also thought these AI tools sometimes provided false information and were developed using algorithms that did not allow for the essays to stand out as unique and creative pieces of writing. Some of these perceptions are illustrated by the remarks of three students:

*“So ai based essays tend to be bland and generic in comparison to the quality’s that are found in essays written by people.”*

*“The essays that the AI writes seem artificial, also occasionally they will put things in there that is just wrong and for things as important college I don’t trust AI.”*

*“I want my essays to stand out from other people’s, and I feel that using AI will cause my essays to be boring and unable to be unique.”*

### **Reflection of Skills and Abilities**

A number of students thought using AI tools to write college admissions essays would not allow them to show their writing and communication skills and abilities. AI-generated essays would not convey to college admissions staff the efforts students put in when writing a quality essay, the students' real opinions and values, or the students' potential. This is reflected in these students' comments:

*"I believe that when writing a college admission essay it should give an accurate display of what the potential student is capable of. Not what the computer came up after being given a topic."*

*"College essays are meant to reflect the values, experiences, and goals unique to each student, not what an AI tool generated."*

*"College essays are meant to be a measure of the applicant's writing abilities, not their ability to ask AI for help."*

### **Unique Writing Style**

There were students who preferred their own writing styles for developing college admissions essays because they wanted colleges to see their unique voices in the essays they wrote. For these students, AI tools would not be able to show a person's unique writing style because the individual qualities of a writer's style (such as tone, voice, and word choice) would not be reflected by AI. Two students stated the following:

*"Using an AI tool would not display who I am as a writer. My writing style is unique, and computer generated responses would not carry my voice the same way."*

*"You lose your writing voice when using AI. When you use AI your own personality and word choice is lost to a specific type of someone else's writing style."*



**Table 3.** Top Outcome-Related Reasons for Not Using AI Tools for College Admissions Essays (by rank order)

Dishonest and unethical practice ( $n = 709$ )
Negative consequences ( $n = 186$ )
Defeating essay purpose ( $n = 144$ )
Sense of accomplishment ( $n = 118$ )
Undermine learning and growth ( $n = 64$ )

### ***Dishonest and Unethical Practice***

Many students thought using AI tools to write their college essays would be deceptive and wrong. Some students indicated that AI-generated essays would compromise their integrity and ethics. Others described using AI as plagiarism and thought it would be cheating to take the work of others and use it as their own. Further, there were students who felt that using AI to write essays would be unfair to the students who wrote their own college essays. These thoughts are highlighted by the comments of four students:

*“If I use AI to write my college admissions essay for me it would feel like cheating. It would be unfair to other people who put the work in to write their essays in their own.”*

*“That would be unethical, lots of AI tools simply steal from the creations of people who actually work hard.”*

*“In my opinion, it is dishonest and lazy to rely on a computer to write for oneself. An AI is fed an algorithm to copy or mimic human behavior and speech, so not only is it dishonest, it is theft, since the AI must be fed things from multiple sources.”*

*“I believe that using AI tools to do your work for you be it school assignments or college essays should be considered fraudulent and plagiarism as you did not produce the end product yourself. I consider it to be the same as asking another person to do your work for you and then just plastering your name on the front. This is not ok.”*



### **Negative Consequences**

With the potential to experience negative consequences from using AI, there were students who thought it would not be worthwhile to use AI when writing college admissions essays. They were afraid of getting caught using AI tools for their essays. They were also concerned about potential punishment, such as not being accepted into a college or having an admission offer revoked, as stated by three students:

*“Because AI use is detectable, which would probably result in me getting rejected.”*

*“I believe it is risky and that the college I might attend might rescind my acceptance if I use an ai tool to right my essay.”*

*“I feel like there are other AI tools which would allow colleges to search college admission essays to check whether it was written by AI or by person. This could possibly cancel my college essay and application.”*

### **Defeating Essay Purpose**

A few students did not consider using AI tools when writing college admissions essays because they thought it would be contrary to the purposes of the college essay, which helps colleges learn more about a student’s point of view, determine how well the student would fit at the college, and uncover why the college should choose the student. This is reflected in the comments of two students:

*“Because that defeats the entire purpose of those essays which is to allow college admissions officers to understand the applicants on a more personal and genuine level.”*

*“I am going to college, not the AI. I need to write my essays myself in order for the college to accurately assess if I would be a good fit.”*



### ***Sense of Accomplishment***

Some students considered it important to earn their admission to college, and AI-generated essays would not allow them to feel like they had earned acceptance at their desired colleges. Other students wanted to be proud of the work they did in writing their own college essays, and this would not be possible if they used AI tools. These thoughts are conveyed by four students:

*“I don’t think I’ll be using AI tools since I think that I could write it myself and I’ll have something to be proud of doing myself.”*

*“If I get into a good college, I want to earn it and I want all the work to be my own.”*

*“I want to get into college by my own merit, not by that of a computer.”*

*“If I used an AI tool to write my essay, I would feel like I didn’t actually earn my spot in the school which would leave me feeling guilty and unaccomplished.”*

### ***Undermine Learning and Growth***

There were also students who thought that using AI for writing essays would prevent them from learning or keep them from enhancing their writing skills. If AI does the work of generating essays, then a student cannot discover how to build a compelling essay or learn from any mistakes. Other students thought that using AI would undermine their human creativity since they would not be crafting essays based on their own ideas, which is an important skill for both school and work. These ideas are reflected in the words of three students:

*“AI tools cannot write my story. I know that the world is becoming more integrated with AI but I think that is so detrimental. If we rely on AI, we can’t come up with our own thoughts.”*

*“I have not considered using AI tools to write my college admissions essays because I would rather prefer to learn how to improve through advice and criticism and use the writing time as a learning moment instead of taking an easy way out and ruining my chances of learning new skills.”*

*“Though some may argue that it sparks creativity and can help with ideas, it actually limits imaginative growth by creating a dependency on outside sources for something that people have done for decades without such assistance.”*



## Discussion

Since ChatGPT was released for public use in late 2022, the use of generative AI tools has been a hot topic in education. Discussions have centered on whether these tools should be allowed in classrooms and, if so, how to use them to improve learning and teaching. Understanding students' experiences and perspectives on using AI tools could provide insights into what students need and how to better support them. In this study, almost half of the participating students reported that they had used AI tools, and the most common tool they used was ChatGPT. Among students who did not use AI tools, the top reason for not using them was having no interest in them. About two thirds of students also reported that they did not trust the information provided by AI tools, and a little over half indicated that they did not know enough about AI tools to use them. Due to the timing of the survey, these numbers may already have changed, as generative AI tools are becoming more popular. Hence, these results may provide a conservative estimate of AI tool use among students.

One interesting finding in this study was the relationship between students' academic achievement level (as measured by ACT Composite scores) and AI tool use. Students with higher academic performance were significantly more likely to use AI tools than were students with lower academic performance. While more research will be needed to further investigate why there was such a difference in use, previous research could provide some possible explanations. A widely used technology acceptance theory, the Technology Acceptance Model (TAM), revealed that two key predictors of users' behavioral intention in adopting and using a new technology were perceived ease of use and perceived usefulness (Davis, 1989). Because more students with lower academic performance reported that they did not have access to AI tools and/or did not know enough about them, their perceptions of the ease of use and the usefulness of AI tools would potentially be lower than those of students with higher academic performance, which in turn would have led to the lower percentages of use. Further, researchers have extended the TAM and found that other factors, such as self-efficacy and cognitive engagement, were also important in predicting the use of educational technologies (San Pedro & Moore, 2023). Thus, another possible explanation is that higher-achieving students were more likely than lower-achieving students to believe themselves capable of learning with new AI tools and were therefore more engaged in active learning with such tools.

A third possible explanation is that another variable influenced the relationship between academic achievement and the use of AI tools. For example, perhaps students with higher family incomes, which are associated with benefits and opportunities that might not be available to students with lower family incomes, have higher levels of both academic achievement and AI tool use. Multiple linear regression was used to investigate this hypothesis. It was found that ACT Composite score was a statistically significant predictor of AI tool use but that family income category was not, which indicated that family income category did not influence the relationship between AI tool use and academic achievement as measured by ACT Composite score.

Although students with higher academic performance were more likely to use AI tools, among those who did not use AI tools, higher-performing students were also more likely to report that they were not interested in using AI tools. These somewhat inconsistent findings could result from higher-performing students knowing how to use the tools (because of relatively high access to and knowledge of them) while at the same time recognizing the tools' limitations (such as not always providing trustworthy information). This recognition of the tools' limitations may drive higher-performing students' lack of interest in using them.



In terms of the purposes of AI tool use, almost half of students who had used AI tools reported having used them for school assignments. The tools were most often used for language arts (writing) and social studies assignments. Students also used AI tools for purposes other than school assignments, including for entertainment or hobbies and to get personalized recommendations. Interestingly, although students were already using AI tools for school assignments at the time of this study, not all their teachers supported this. About two thirds of students reported that none of their teachers allowed them to use AI tools for school assignments, and approximately one fourth indicated that their schools had banned AI tools on school-owned networks and devices. One issue that schools should consider when deciding whether to ban AI tools is whether there is equal access to these tools. If students are allowed to use AI tools only with home devices, then students with very limited access to electronic devices might have an educational disadvantage due to the digital divide (Moore et al., 2018).

In fact, with the advancement of AI technologies, it seems inevitable that these tools will bring changes to learning and teaching. Thus, recent discussions among researchers have been focused not on whether to ban AI tools but on how to incorporate them into the school environment. Despite the earlier decisions to ban ChatGPT in school districts, some school leaders are now focusing on the benefits of AI use among students and establishing rules for appropriate use (Jones et al., 2023). If used properly, AI tools have the potential to promote teaching and learning by, for example, promoting personalized and interactive learning, generating prompts for formative assessments, and offering ongoing feedback (Baidoo-Anu & Ansah, 2023). Also, teachers could play an important role in helping students use AI tools in their learning. For example, a recent study found that teacher support was effective in motivating novice students' learning with AI chatbots (Chiu et al., 2023). It is important to note that some students may not have access to AI tools due to limited access to digital technologies at home. As schools and educators consider the use of AI for teaching and learning, it will be important to keep in mind the potential inequities in access to AI tools, and to support students who may lack access.

It will also be important for educators to keep in mind other limitations of AI tools, which include a tendency to generate incorrect information and make up articles that do not exist, a limited understanding of concepts, a lack of contextual understanding, and biases in data training (Baidoo-Anu & Ansah, 2023). In this study, about two thirds of the students who had used AI tools for school assignments reported that they had found errors or incorrect information in the tools' responses. Additionally, students with higher academic achievement levels were more likely to indicate that they had found errors or incorrect information than were students with lower academic achievement levels. Therefore, when students are using AI tools in a classroom setting, it seems appropriate for teachers to be cautious and remind students of the potential risks and the tools' limitations.

Because generative AI tools are relatively new to education and still have limitations, it is still unclear how these tools could affect students' academic, cognitive, and behavioral development. In this study, we asked students to what extent they believed using AI tools for school assignments would affect their creativity, critical thinking, persistence, and overall academic performance. More students believed their creativity would increase than believed it would decrease (50% vs. 28%), while their opinions on critical thinking and persistence were mixed. On the other hand, nearly three quarters of students believed that their overall performance in school would improve because of using AI tools. More empirical studies are needed to investigate the cognitive, behavioral, and academic effects of generative AI tools on students. Previous studies of other educational technologies have demonstrated some promising benefits of these advanced tools for students' learning (Cheung & Slavin, 2013). For example, certain adaptive technology tools have been effective in enhancing students' academic performance (Pane et al., 2014) and improving affective predispositions (Arroyo et al., 2013). Thus, we have some evidence suggesting that generative AI tools, with more advanced features offering personalized and interactive user experiences, would benefit students if used appropriately and safely.

Even though a large proportion of students reported that they had used AI tools for school assignments, their opinions on whether they should use AI tools for college essays were clearly negative. Nine out of ten participating students had not considered using AI tools to write their college admissions essays. In their responses, students expressed the reasons why they did *not* consider using AI tools for this purpose. First, students believed that the current versions of AI tools still have limitations that render the tools incapable of generating high-quality, personalized, original, and authentic college admissions essays that reflect students' skills, abilities, and unique writing styles. Second, students discussed their concerns about the consequences of using AI tools to write their college essays. They considered it a dishonest and unethical practice that defeated the purpose of writing a college admissions essay. Moreover, they were afraid of the negative consequences of being caught, and they wanted the sense of accomplishment that came from writing their own essays. Some students also pointed out that using AI tools to write these essays could undermine learning



and growth during the process. Although some tests of ChatGPT showed that it could write a college essay with basic structure and narrative (Whitford, 2022), students generally were not willing to accept this option. However, a small proportion of students did admit that AI tools would be useful for improving grammar, sentence composition, and essay structure, as well as for generating ideas.

It seems likely that high school students' use of AI tools will continue to increase, both inside and outside the classroom. These tools appear to have much potential to enhance student learning, but as we have seen from students' feedback, there are concerns about appropriate use and potential negative outcomes. It is important, therefore, that educators and parents help high school students learn to use AI tools appropriately, ethically, and fairly.

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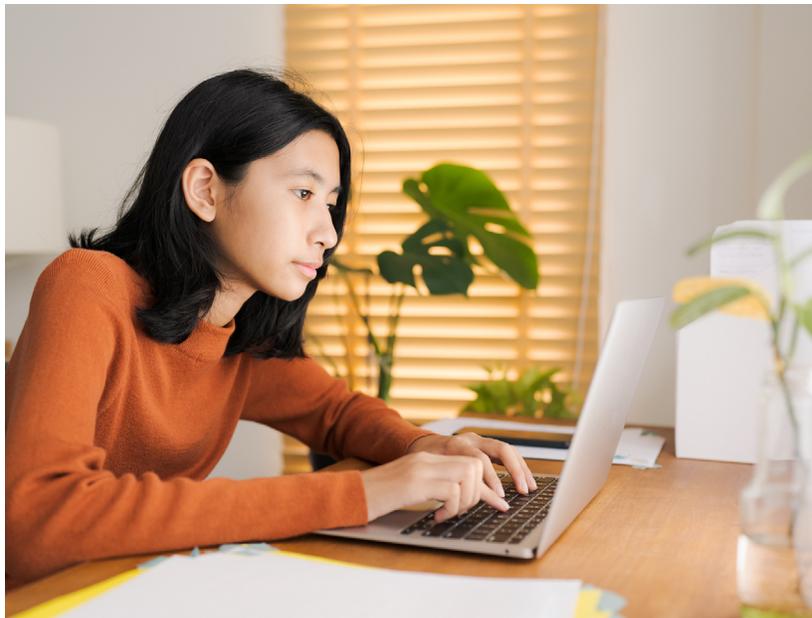
## Notes

1. Generally accepted guidelines for interpreting effect sizes (ES) are as follows: An effect size (in absolute value) of 0.20 or less is small, 0.21–0.49 is small to medium, 0.50–0.79 is medium to large, and 0.80 or more is large.
2. Thematic qualitative analysis procedures were conducted to analyze students' responses to the open-ended question. All responses were read, segmented by relevance (some comments were excluded because of a lack of relevance), and coded by a qualitative research expert to construct tentative categories. These categories were reviewed and verified by a second qualitative research expert.

## Technical Appendix

### Sample

A stratified random sample of 79,412 high school students in Grades 10, 11, and 12 nationwide was used for this study. At the time the sample was prepared, these students had registered for the June 2023 national ACT® test, but they had not yet taken it. These students are presumed to be college-bound, although it is possible that some of them will not attend college. Asian, Black, and Hispanic students were intentionally oversampled to ensure enough respondents for analyses by race/ethnicity. Students were invited via email to participate in the online survey. A total of 4,006 students responded to the survey, for a response rate of 5%.



Student characteristics (race/ethnicity, gender, high school grade point average, high school rank, and grade level) are reported in Table A1 for the survey's target population, sampled population, sample, and respondents. All the characteristics in this table were self-reported by students and were collected when the students registered for the national ACT.

**Table A1.** Characteristics of the Survey Population, Sample, and Respondents

Characteristics		Target population		Sampled population		Sample		Respondents	
		n	%	n	%	n	%	n	%
Race/ethnicity	American Indian/Alaska Native	620	0%	582	0%	320	0%	9	0%
	Asian	9,701	6%	9,028	6%	9,028	11%	608	15%
	Black	14,964	10%	13,934	10%	13,934	18%	493	12%
	Hispanic	18,365	12%	17,130	12%	17,130	22%	806	20%
	Native Hawaiian/Other Pacific Islander	149	0%	136	0%	70	0%	1	0%
	White	97,754	63%	90,488	63%	32,000	40%	1,720	43%
	Two or more races	6,675	4%	6,212	4%	3,430	4%	187	5%
	Prefer not to respond	6,758	4%	6,266	4%	3,460	4%	179	4%
	Unknown	83	0%	72	0%	40	0%	3	0%
Gender	Female	88,177	57%	81,872	57%	45,506	57%	2,440	61%
	Male	64,956	42%	60,197	42%	32,930	41%	1,488	37%
	Other/Unknown	1,936	1%	1,779	1%	976	1%	78	2%
High school grade point average	(A- to A) 3.5 4.0 or higher	104,529	67%	96,867	67%	50,146	63%	3,088	77%
	(B to B+) 3.0 3.4	20,985	14%	19,499	14%	11,310	14%	368	9%
	(B- to B) 2.5 2.9	6,509	4%	6,086	4%	4,066	5%	86	2%
	(C to B ) 2.0 2.4	2,705	2%	2,532	2%	1,834	2%	19	0%
	(C- to C) 1.5 1.9	623	0%	583	0%	450	1%	12	0%
	(D to C ) 1.0 1.4	115	0%	108	0%	82	0%	1	0%
	(D- to D) 0.5 0.9 or lower	12	0%	11	0%	8	0%	0	0%
	Unknown	19,591	13%	18,162	13%	11,516	15%	432	11%
High school rank	Top quarter	76,751	49%	71,144	49%	35,996	45%	2,307	58%
	Second quarter	29,358	19%	27,243	19%	15,170	19%	540	13%
	Third quarter	11,161	7%	10,395	7%	6,433	8%	184	5%
	Fourth quarter	4,637	3%	4,291	3%	2,711	3%	76	2%
	Unknown	33,162	21%	30,775	21%	19,102	24%	899	2%
Grade level	12	15,276	10%	14,138	10%	9,657	12%	185	5%
	11	121,080	78%	112,399	78%	61,007	77%	3,205	80%
	10	18,713	12%	17,311	12%	8,748	11%	616	15%
<b>Total</b>		155,069	100%	143,848	100%	79,412	100%	4,006	100%

The target population included U.S. high school students in Grades 10, 11, and 12 who registered for the June 2023 national ACT test. The sampled population, which is a subset of the target population, excluded students who opted out of receiving nontransactional communications from ACT. It also excluded students who were in samples for other recent ACT surveys. A stratified random sample (disproportionately stratified on race/ethnicity) was drawn from the sampled population.

The sample and respondents differed on some characteristics. For example, students who reported that they were in the top quarter of their high school class represent 45% of the sample but 58% of the respondents. It is typical in surveys of ACT test registrants and test takers for students who report higher class ranks and higher grade point averages to respond at higher rates compared with those who report lower class ranks and lower grade point averages. In addition, it is typical in these surveys for Asian and White students to respond at higher rates than Black and Hispanic students and for females to respond at higher rates than males.

The oversampling of Asian, Black, and Hispanic students is illustrated in Table A1. These racial/ethnic groups represent 6%, 10%, and 12%, respectively, of the sampled population but 11%, 28%, and 22%, respectively, of the sample. White students represent 63% of the sampled population but only 40% of the sample. Weights were used to adjust statistically for these differences in representation. Additional information on the weights is provided in the Analysis section.

## Survey Instrument

The survey instrument was administered online to participating students in June 2023. The instrument's introduction provided a definition of AI tools to try to ensure that students had in mind a specific class of tools as they were responding to the questions. The introduction and AI tool definition are shown below.

“This survey asks about your experience with and opinion of AI (artificial intelligence) tools, whether used in school or in your personal life. These are tools that can be used in a **text-based, conversational way, where a person asks questions or makes requests**, and the tool generates responses.

Examples include:

- ChatGPT,
- Bing Chat, and
- Google Bard.”

The survey instrument contained several questions, the first of which was intended to identify whether each respondent was a student who had registered for the ACT test, a parent or guardian who had assisted with a student's registration, or a school counselor who had assisted with a student's registration. This question was needed because when caregivers and counselors assist with a student's ACT registration, they sometimes provide their own email address instead of the student's. This results in survey invitation emails being sent unintentionally to caregivers and counselors. Only those respondents who indicated that they were students were permitted to continue the survey.

The other questions are listed below.

1. *Have you used AI tools?* (no, yes)
2. *Are any of the following a reason why you have **not** used AI tools?* (yes, no)
  - a. I don't have access to AI tools.
  - b. I'm not allowed to use AI tools.
  - c. I'm not interested in using AI tools.
  - d. I don't know enough about AI tools.
  - e. I don't trust the information provided by AI tools.
  - f. Other (please describe)  
(Displayed only if answer to Question 1 is "no")
3. *Which of the following AI tools have you used?* (used, not used)
  - a. ChatGPT
  - b. Bing Chat
  - c. Google Bard
  - d. Dall-E 2
  - e. Other (please describe)  
(Displayed only if answer to Question 1 is "yes")
4. *Have you used AI tools for school assignments?* (yes, no)  
(Displayed only if answer to Question 1 is "yes")
5. *How often do you use AI tools for school assignments?* (two or more times a day, at least once a day, a few times a week, about once a week, a few times a month, once a month or less)  
(Displayed only if answer to Question 4 is "yes")
6. *Have you used AI tools for school assignments in any of the following courses/subjects?* (yes, no)
  - a. Language Arts – writing
  - b. Language Arts – other (speaking, vocabulary, etc.)
  - c. Computer Science/Programming
  - d. Math
  - e. Science
  - f. Social Studies
  - g. Other (please specify)  
(Displayed only if answer to Question 4 is "yes")
7. *ACT defines creativity as "generating original ideas, using existing ideas in new ways, and having an active imagination." To what extent do you think your creativity will increase or decrease because of using AI tools for school assignments?* (increase a lot, increase a moderate amount, increase a small amount, neither increase nor decrease, decrease a small amount, decrease a moderate amount, decrease a lot)  
(Displayed only if answer to Question 4 is "yes" and AI tools are indicated as being used in one or more of the courses/subjects listed in Question 6. This same logic pertains to Questions 8–11.)

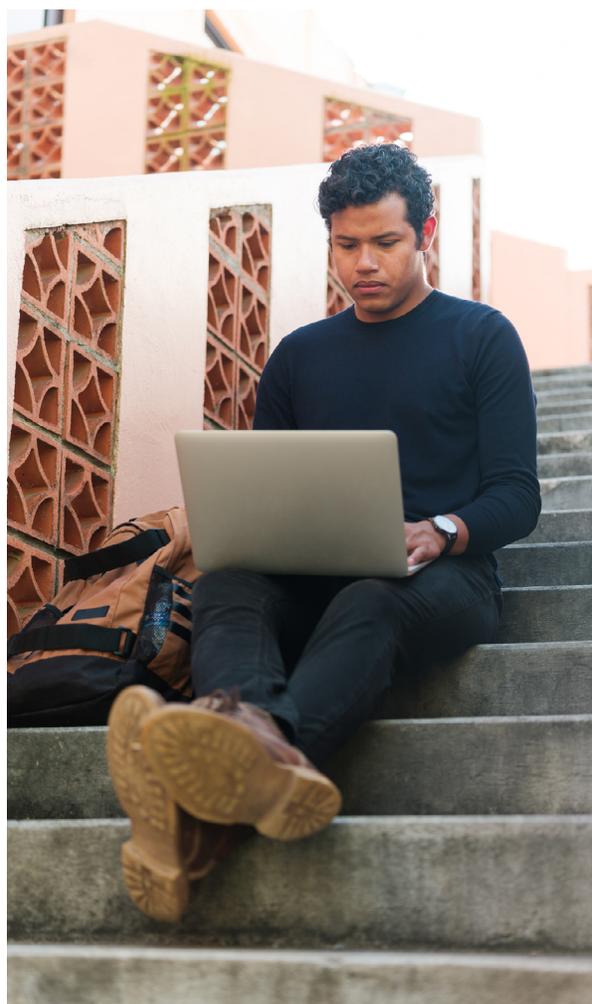
8. *ACT defines persistence as “working hard, making progress on relevant tasks, and maintaining focus despite setbacks or difficulties.” To what extent do you think your persistence will increase or decrease because of using AI tools for school assignments?* (increase a lot, increase a moderate amount, increase a small amount, neither increase nor decrease, decrease a small amount, decrease a moderate amount, decrease a lot)
9. *To what extent do you think your critical thinking (i.e., your ability to analyze, evaluate, synthesize, and expand information) will increase or decrease because of using AI tools for school assignments?* (increase a lot, increase a moderate amount, increase a small amount, neither increase nor decrease, decrease a small amount, decrease a moderate amount, decrease a lot)
10. *To what extent do you think your overall performance in school will improve or decline because of using AI tools for school assignments?* (improve a lot, improve a moderate amount, improve a small amount, neither improve nor decline, decline a small amount, decline a moderate amount, decline a lot)
11. *When using AI tools for school assignments, have you found errors and/or incorrect information in the responses generated by the tools?* (no, yes)
12. *Have you used AI tools for any of the following purposes?* (yes, no)
  - a. Help with my writing (other than for school assignments)
  - b. Help with my coding (other than for school assignments)
  - c. Translating text
  - d. Personalized recommendations (e.g., movies I might like, shopping assistance)
  - e. Entertainment/hobbies (e.g., writing songs or poetry, art/graphics)
  - f. Other (please describe)(Displayed only if answer to Question 1 is “yes”)
13. *Has your school banned AI tools on school-owned networks and devices?* (no, yes, I don’t know)
14. *Do you think your school should ban AI tools on school-owned networks and devices?* (no, yes, I don’t know)
15. *How many of your teachers allow students to use AI tools for school assignments?* (all, most, some, few, none)
16. *Have you considered using AI tools to write your college admissions essays?* (no, yes, not applicable: I don’t plan to attend college, or essays are not required at the colleges/universities I’m considering)
17. *Could you please explain why you [have or have not] considered using AI tools to write your college admissions essays?* (open-ended text response)  
(Displayed only if the answer to Question 16 is “no” or “yes”)

18. *Has the emergence of AI tools caused you to consider different and/or new options for your college major/program of study? (no, yes, maybe)*
19. *Has the emergence of AI tools caused you to consider different and/or new options for your future job/career plans? (no, yes, maybe)*
20. *Do students who use AI tools for school assignments have an advantage over students who do not use them for school assignments? (definitely have an advantage, probably have an advantage, might or might not have an advantage, probably do not have an advantage, definitely do not have an advantage)*
21. *Please use the space below for anything else you would like to share about AI tools. (open-ended text response)*

## Analysis

Analyses were performed on data from the entire group of students ( $N = 4,006$ ). Although we selected a stratified random sample in order to analyze the data by racial/ethnic group, preliminary racial/ethnic group analyses demonstrated few substantive differences in survey responses across groups and identified some potential interpretational problems. Therefore, findings for racial/ethnic groups are not reported in this paper but might be a topic of future research.

Because the sample was disproportionately stratified on race/ethnicity, weights that reflect statistical adjustments for population representation in the sampling design and survey nonresponse were used in the computation of weighted sample statistics. These statistics serve as estimates for the population of students in Grades 10, 11, and 12 who registered for the June 2023 national ACT.



Percentages of responses were computed for all survey questions, and mean responses were computed for questions that had appropriate scales (i.e., Questions 5, 7–10, 15, and 20). For each multiple comparison of mean responses across ACT Composite score categories, an analysis of variance (ANOVA) with pairwise comparisons based on the Tukey-Kramer procedure was used. The test statistic yielded by this procedure is denoted in this report by  $q$ .

Whenever a statistically significant difference was observed between a pair of means, an effect size (ES) was computed. Effect sizes for differences between means were computed using a pooled sample standard deviation as the denominator. Effect sizes for differences between proportions were computed using Cohen's  $h$  (Cohen, 1988).

Chi-square tests of association were used for analyses by ACT Composite score category. The test statistic from this procedure is the Rao-Scott chi-square, and it, like other statistics in this report, reflects adjustments based on the study's complex sampling design.

Multiple linear regression was used to further investigate a few unusual findings. For example, the use of AI tools was modeled as a function of ACT Composite score and family income category. The threshold for statistical significance of tests of regression coefficients in these models was  $p < 0.01$ .

For various reasons (e.g., change of plans or illness), not all students who register for the national ACT subsequently take it. Of the 4,006 registrants who responded to the survey, 3,772 took the test and had ACT Composite scores. Except for analyses that included ACT Composite scores, all respondents were included in the analyses, whether they tested or not.





## About ACT

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