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# Effects of Educating Teachers and Students on Proper AI Usage

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## ABSTRACT

Artificial Intelligence (AI), has become a staple in students' education. Reports indicate that most students in the United States utilize AI to help with schoolwork. As a result, it is imperative that educators understand how to best regulate students' usage of AI to ensure students are properly developing their academic abilities. This paper demonstrates through a preliminary survey that AI usage is rampant in schools, even if that school has an AI policy. Moreover, surveys demonstrate that most students do not understand how they are expected to utilize AI, mainly because the teachers themselves do not understand AI. So, through an experiment and a survey, this paper proves that when teachers are properly trained how to guide students in using AI on assignments, students both perceive AI as beneficial, and actually use it to develop their critical thinking skills. Without this teaching or guidance, however, students both perceive and use AI as an easy way out of doing work. Even if a school or district has an AI policy, the results of this study show that proper teacher professional development and student guidance is necessary to properly develop students' critical thinking skills in the classroom.

## INTRODUCTION

Generative AI (genAI) can be defined as "Artificial intelligence (AI) that can create original content such as text, images, video, audio or software code in response to a user's prompt or request," says Cole Stryker, the Editorial Lead for AI Models at IBM and Mark Scapicchio, Content Director, Inbound and SEO for IBM (Stryker & Scapicchio, 2024). GenAI plays a major role in education, as 84% of high school students reported that they use AI for schoolwork, says Jessica Howell, Vice President of Research at College Board, and Sophia Romee, head of the GenAI Studio at The College Board (Howell & Romee, 2025). Despite this, according to a nationally representative EdWeek Research Center survey of 953 educators, including 553 teachers, "More than 7 in 10 teachers said they haven't received any professional development on using AI in the classroom" (Langreo, 2024). According to Katsenou Rena et al., who works in the Department of Audio and Visual Arts, Faculty of Music & Audiovisual Arts, at the Institute for Games Research, Ionian University, teachers are vital in guiding students throughout their intellectual development, and a lack of knowledge on such a widely used component of students' education, AI, can be detrimental to students' intellectual development (Katsenou et al., 2025).

This research paper investigates how educating teachers on how to properly utilize AI allows students to utilize AI in a manner that supplements their intellectual development. The following literature review explores teachers and students' concerns regarding AI, AI's effects on students' education, and teachers' lack of training regarding AI policies in schools.

## LITERATURE REVIEW

### *Concerns Regarding AI*

Although AI is widely used in schools, teachers and students have many ethical concerns regarding the use of AI in education. According to a survey distributed to 500 educators in the United States by Ilana Hamilton, who received her bachelor's degree in English from Reed College, 65 percent of educators say that plagiarism is their greatest concern about the use of AI in education (Hamilton, 2024). In response to an open-ended survey about AI in education conducted by Kevin Bushweller, the assistant managing editor in charge of technology & learning environments coverage at Education Week, a High School teacher in Florida illustrated teachers' concerns regarding plagiarism, saying, "ChatGPT needs to be banned . . . Use of brain cells and the pursuant expansion of the mind are gone. Students are just looking for an easy way out of doing work" (Bushweller, 2024). A complete ban on AI, however, is unrealistic due to the prominent usage of AI among students. Therefore, teachers must learn how to guide students towards critically thinking skills with AI, rather than neglecting it.

In addition to teachers' concerns about cheating**,** students have concerns about the accuracy of genAI. According to MIT Sloan Teaching and Learning Technologies, which focuses on enhancing teaching and learning through technology, "AI tools like ChatGPT, Copilot, and Gemini have been found to provide users with fabricated data that appears authentic" ("When AI Gets It Wrong," 2024). As a result, many students do not trust genAI, with one student saying, in a survey done by Rebecca Black, who earned her Ph.D. in Curriculum and Instruction from the University of Wisconsin, and Bill Tomlinson, a professor at UC Irvine's Donald Bren School of Information and Computer Sciences, "[AI is] not accurate enough and to me just not trust worthy" (Black & Tomlinson, 2025). Although AI is on track to become a staple component in the education system, teachers' concerns about cheating and accuracy concerns among students hurt the effectiveness of AI in education.

### *How AI Affects Students' Education*

Teachers' concerns about cheating are not unwarranted, because if used improperly, AI has shown to be used uncritically and hurt students' ability to think independently. According to Katsenou Rena et al., with an unguided use of AI, students use AI as "a mere instrument of efficiency," and not a tool to evolve as a critical thinker (Katsenou et al., 2025). Studies show, however, that students who utilize critical thinking techniques throughout their interaction with AI enhance their own ability to critically think. In a study done by Nesma Ragab Nasr et al., who works in the College of Education, Northern Arizona

University, Emily and Robe, two college students, utilized ChatGPT to complete an assignment. Emily and Robe did not just copy the answers that ChatGPT gave them, but they questioned and analyzed ChatGPT's responses. By the end of their assignment, Emily and Robe completed all four stages of cognitive presence, which indicates how learners utilize critical thinking skills. Nesma says, "This indicates that the structured utilization of GenAI facilitated their attainment . . . and demonstrated critical thinking when interacting with GenAI ChatGPT" (Nasr et al., 2025). Nesma's study demonstrates that a structured and guided use of AI improves students ability to critically think.

Guoqing Zhao et al., who works in the Faculty of Education at Beijing Normal University, says that teachers can facilitate their students' use of critical thinking skills when collaborating with AI by "encouraging them to analyze, evaluate, and refine the GAI [GenAI] responses, thus engaging them in critical thinking activities" (Zhao et al., 2025). By guiding students on how to properly utilize AI, teachers can encourage students to utilize and develop their critical thinking skills when collaborating with AI.

### *Lack of Training/AI Policies*

According to the Hastings Initiative at Bowdoin College, which guides ethical AI usage, 31% of schools have AI policies ("AI in High School Education," 2025). Due to the prevalence of AI policies in schools, it is important that these policies effectively guide students towards proper AI usage. Ethan Mollick, an associate professor at the Wharton School, and Lilach Mollick, the co-director of the Generative AI Lab at Wharton, developed a strategy for an effective AI policy in schools. They said that educators should utilize AI to create multiple examples and explanations of topics to encourage students to critically think and analyze each explanation in order to fully understand the topic (Mollick & Mollick, 2023). Although strategies like these are essential for AI policies in schools to succeed, it is equally as important to teach educators about these strategies. Miguel Cardona et al., the former Secretary of the U.S. Department of Education, says that for an AI policy to be successful, teachers must be heavily involved in the development process of AI policies, and "the use of technology in teaching and learning should be a core theme across teacher preparation programs, not an issue that arises only in one course" (Cardona et al., 2023). These courses that educate teachers how to utilize AI successfully inform teachers, as demonstrated by Middle School teacher Kevin Bushweller in a survey about the AI information course: "[The instructor] shared insights and HOW to use AI in a purposeful way, which completely changed my view of what it can and cannot do!" (Bushweller, 2024). Kevin indicates that AI training programs for teachers allow educators to become more knowledgeable regarding how AI can be used in education.

Despite the importance of teacher involvement for an AI policy to be successful, "68% of teachers report not engaging with any institution-provided training" ("AI in High School Education," 2025). As a result, many teachers are unsure how to properly utilize AI to foster the growth of students' critical thinking skills, with one high school teacher saying, "Students have begun accessing/using AI technologies without any guidance on appropriate/innapropriate use and therefore are running into inappropriate usage issues" (Bushweller, 2024). Of the 14 percent of schools that do teach students about how to use AI, some schools focus only on inappropriate usage, without teaching students how to actually utilize AI in a manner that improves their critical thinking skills ("AI in High School Education," 2025). The lack of

consistency and communication with AI policies result in teachers, and therefore students, being unaware how to utilize AI ethically and critically.

## GAP IN RESEARCH

There is a gap about how AI policies in schools can be both created and enforced to foster critical thinking development in students. By studying high school teachers and students in a private school, this study will analyze the benefits for students when teachers are properly trained on how to implement and teach AI policies in their classroom. By educating teachers on how students can utilize AI to stimulate critical thinking skills, this study aims to identify whether proper teacher professional development and guiding students throughout their AI interaction will benefit both students' perceptions and use of AI in education.

## HYPOTHESIS

The researchers' hypothesis is that without training teachers and without proper guidance on assignments, students will perceive AI as a tool that takes away from their intellectual development. After teachers are educated on how students can utilize AI to stimulate their critical thinking skills, however, teachers will be able to better inform students on how they should properly utilize AI on assignment. As a result, students will utilize critical thinking skills throughout their interaction with AI, and they will perceive AI as a tool that can supplement their development of critical thinking skills.

## METHODOLOGY

This research investigated the effects of educating teachers on proper AI usage on students' usage and perception of AI in education. To gather preliminary data before narrowing the scope of the later experiment, 109 high school students and 20 high school teachers from the same private High School with an AI policy completed an anonymous survey investigating their opinions about AI and their usage of AI in school. Student and teacher respondents were asked binary (yes/no) questions, Likert-scale questions, and free response questions, which compared three subjects:

1. How often students utilize AI on assignments, compared to how often teachers allow AI usage.
2. Students' opinions of AI as a tool to help them critically think, compared to students' opinions of AI as a tool to help save time.
3. How often students received, and the benefits of, teacher instruction on how to utilize AI.

The student and teacher multiple choice responses were analyzed as percentages, a form of quantitative data, which allowed patterns and trends to be studied within the overall survey. The qualitative data in the form of free response answers allowed the researcher to analyze the specific opinions and viewpoints of

students and teachers on the utilization of AI in education. After the preliminary survey was completed, the researcher narrowed the scope of the following experiment to identify the effects teacher training and student guidance has on students' opinions and usage of AI on assignments.

Four months after the preliminary survey was completed, a mixed methods experiment was conducted on four high school English classes. The researcher taught two English teachers using a powerpoint presentation how students should properly utilize AI to stimulate their critical thinking skills. The powerpoint presentation highlighted common mistakes that students make while utilizing AI, such as: asking closed ended questions that elicit a one sentence response and not asking the AI tool follow up questions. The powerpoint instructed teachers that students best utilize AI when they ask open ended questions, ask follow up questions to either question the factuality of the information, clarify a confusing section, or learn more about a specific component of the AI's answer, and finally, synthesize the information learned through the conversation into a final response on the assignment.

The teachers were then provided with a lesson script, and a PowerPoint presentation to go along with the script that the teachers used as a guide during the student instruction part of the experiment. The lesson script and presentation presented the proper ways to utilize AI as a set of rules that the students must follow. The first rule outlined was that the first prompt students input into AI must be an open ended question. They were presented with an example, showing that instead of asking, "Who is Napoleon," they should ask "Explain how Napoleon changed the balance of power in Europe." The second rule students were given was that they must ask follow up questions. The lesson outlined examples of types of follow up questions that could be asked, such as asking for clarification, a real world example, or a counterargument. The final part of the lesson emphasized that AI should not be treated as a google search, and that what is important is not what the AI says, but how the student thinks with it. Both the lesson taught to the teachers and the lesson script and powerpoint provided to the teachers were created using the cognitive presence framework and the prompting strategies applied by Nasr et al. in a study described in the literature review.

All four classes amounted to 48 total students, with two of the classes, totaling 22 students, being assigned to the control group, and the other two, totaling 26 students, being assigned to the test group. For both groups, in the beginning of each of the four classes, the students completed an anonymous survey about how they utilize AI and if they believe AI improves critical thinking skills. For the control group, the teacher assigned an essay and assigned it a "PACE" level of three, meaning students could use AI for brainstorming, outlining, and initial research. The "PACE" system is the current AI policy in place at the school the experiment was conducted in. The levels for the PACE system range from level one, to level four, with the amount of AI that students are allowed to use on assignments increasing at each level. The students were then given no further instructions and were told to complete the assignment.

For the test group, instead of assigning a "PACE" level, the teacher, utilizing the instruction taught to them and the PowerPoint and lesson script provided, taught the students how to properly utilize AI to stimulate critical thinking. The students were then assigned the same essay as the control group, except the students were also required to submit the first prompt they input into AI, and three follow up questions

they asked the AI system. The extra requirements for submission attempted to guide the students throughout their AI interaction. All of the students completed a survey similar to the one in the beginning, asking how they used AI and if they believed utilizing AI to complete the assignment improved their critical thinking skills. They were also asked if they had ever engaged with AI instruction similar to the lesson they received, and if they believed that the AI instruction benefited them. The survey questions consisted of binary (yes/no) items, Likert-scale items, and free response questions.

All the students in all four classes were required to submit a link to the chat logs of their conversation with ChatGPT. The students' chat conversations with ChatGPT were analyzed using a four step rubric, with four total points possible. The rubric was based on cognitive presence, which indicates how critical thinking was used on assignments. One point, 0.5 points, or no points was possible for each of the four steps of cognitive presence: triggering event, exploration, integration, and resolution. The researcher analyzed the students' conversations with AI and determined, using the rubric, if the students demonstrated critical thinking skills while completing the assignment, with a higher score meaning a higher demonstration of critical thinking. The quantitative analysis of the survey responses and the rubric scores, along with the qualitative data from free response answers, allowed the researcher to analyze the differences between the opinions and actual usage of AI in the control group and test group, along with the specific opinions and worries from students.

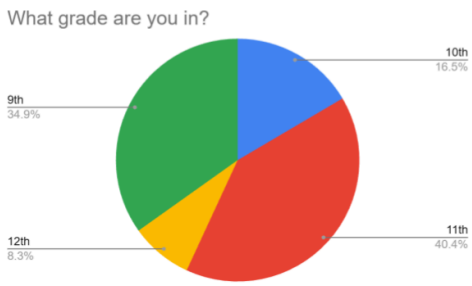
### *Statistical Analysis*

To determine whether the differences between the control and test groups were statistically significant rather than the product of chance, statistical tests were applied to the quantitative data. Responses to binary (yes/no) survey items were compared between groups using chi-square tests of independence; because the small sample sizes produced low expected cell counts, Fisher's exact test was also computed and is reported alongside each chi-square statistic. Cognitive presence rubric scores were compared between groups using independent-samples Welch's t-tests, which do not assume equal variance. Cohen's d was calculated for each comparison as a measure of effect size, with values above 0.8 indicating a large effect. All tests were two-tailed, with statistical significance set at $p < .05$. For binary items measured before and after the intervention within the same group, McNemar's tests were used to assess within group change over time. The phi coefficient (φ) was reported as the effect size for each chi-square test.

## RESULTS & ANALYSIS

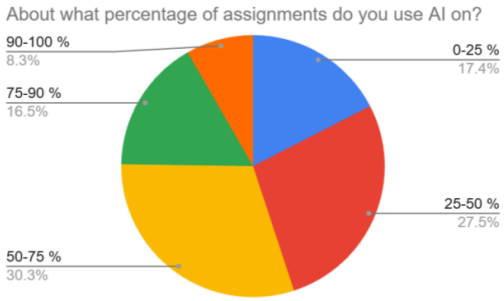
### *Preliminary Survey*

Figure 1



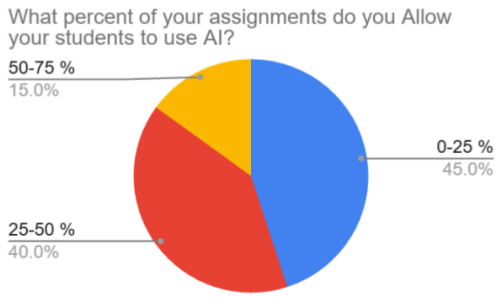

The results of the preliminary survey consisted of 109 high school students, with 34.9% in 9th grade, 16.5% in 10th grade, 40.4% being in 11th grade, and 8.3% in 12th grade (as shown in Figure 1), along with 20 high school teachers.

Figure 2




Students were asked what percentage of assignments they use AI on, with 55.1% saying that they use AI on over 50% of their assignments, and 44.9% of respondents saying that they use AI on less than 50% of their assignments, as seen in Figure 2.

Figure 3

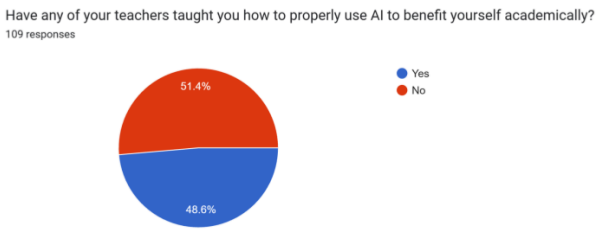



Teachers were surveyed on what percentage of assignments that they allow students to use AI on. 85% of teachers said that they allow AI usage on less than 50 percent of their assignments, with only 15% saying that they allow AI on more than 50 percent of assignments (Figure 3).

A chi-square test of independence confirmed that students use AI on over half of their assignments at a significantly higher rate than teachers permit (55.0% vs. 15.0%), $\chi^2(1, N = 129) = 10.85$, $p = .001$, $\varphi = 0.29$.

This significant difference demonstrates that even with an AI policy, as the school that these students go to has, student AI usage cannot be completely controlled. Therefore, due to the fact that students will utilize AI on assignments no matter the policy, it is best to ensure that students are utilizing AI properly.

Figure 4



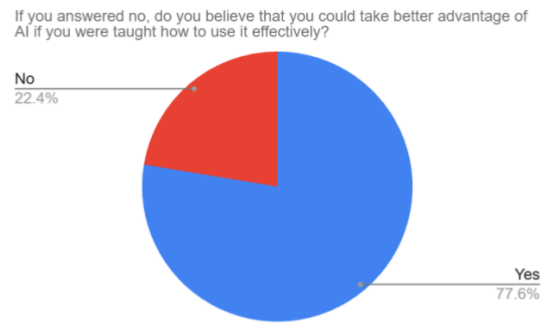

Although the prevalence of AI use among students demonstrates the need for teacher to student instruction on how students should utilize AI, most students said that they have never received any such

instruction. Figure 4 shows that 51.4% of students said that they have not been taught by any teachers how they should use AI to benefit themselves academically, with 48.6% saying that they have.

Figure 5

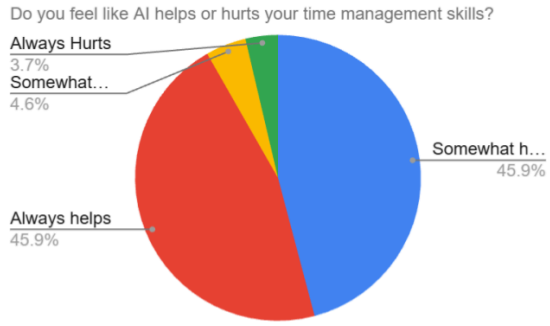

Both the students who have and have not received AI instruction believe that teacher instruction would allow them to better use AI to benefit themselves academically. Figure 5 shows that of the students who have received AI instruction from teachers, 69.1% said that they believe the AI instruction benefited them academically. In a follow up question asking respondents to further explain their response about how AI instruction from teachers benefited them academically, one student said, "Yes, because they have encouraged it and taught us ways to use to benefit us but to not let it takes away from our own work, creativity, and effort that we put into our work."

Figure 6



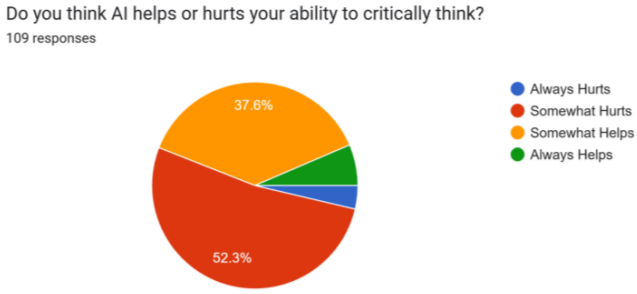

Furthermore, 77.6% of students who have not received AI instruction from teachers say that they believe they could better take advantage of AI if they were taught how to use it by teachers, as shown in Figure 6. Although students have found AI instruction from teachers to be helpful in their understanding of how to use AI, most students have not received any AI instruction from teachers.

Figure 7




Students were asked about how AI affects their time management and critical thinking skills. When asked about their time management skills, 91.8% of students said that they believe AI helps their time management skills (Figure 7).

Figure 8




When asked if utilizing AI helps or hurts their ability to critically think, 56% of students believe that AI hurts their ability to critically think, while only 44% believe that it helps their ability to critically think (Figure 8).

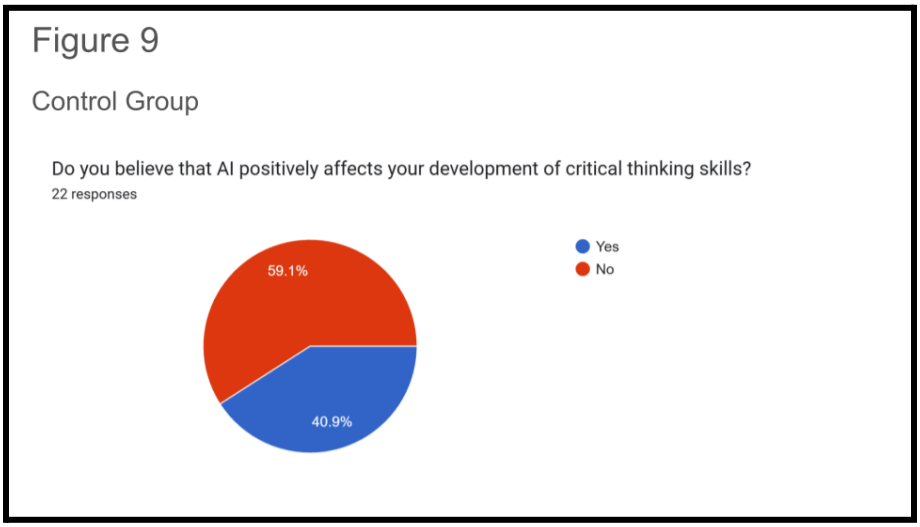
In a follow up free response question asking students to explain their answer to the previous question, one student's response exemplifies the danger of not understanding how to critically think using AI. The student wrote that AI "can give you a straight up answer if you do not direct it the correct way, which can hurt your own thoughts and processing of information." As shown by figures 7 and 8, most students utilize and view AI as a tool to get work done faster, not a thinking partner to help them learn.

### *Experiment*

With regards to the experiment, the survey given to the control group aimed to assess students' perceptions of AI and if their perceptions changed after completing the assignment.

Figure 9

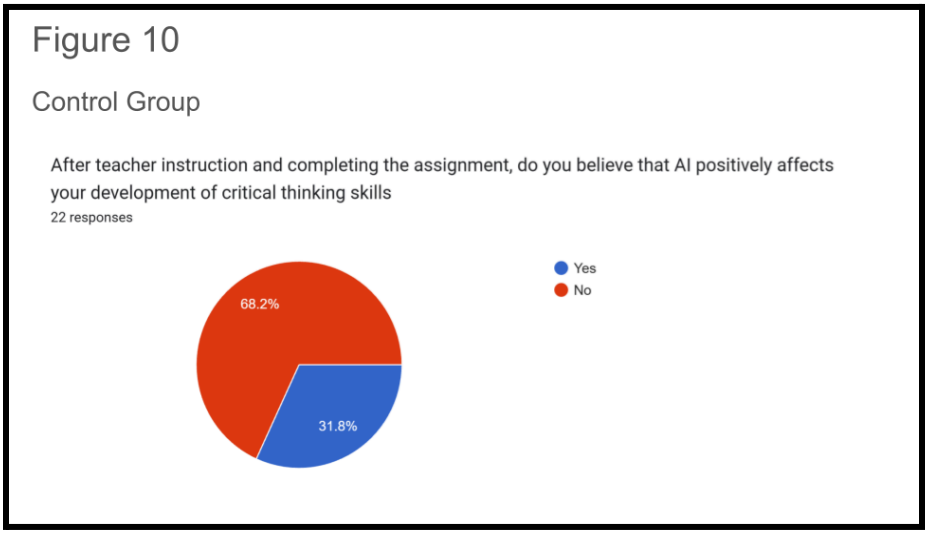
Control Group




Before completing the assignment, students in the control group were asked about AI's impact on their critical thinking skills. 59.1% of the students said that they do not believe AI positively affects their development of critical thinking skills, while 40.9% said that they believe AI does positively affect their development of critical thinking skills, as seen in Figure 9.

Figure 10

Control Group



After completing the assignment, students were asked the same question about how AI affects their development of critical thinking skills. 68.2% of students felt that AI does not positively affect their development of critical thinking skills, while 31.8% of students said that they believe AI does positively affect their development of critical thinking skills (Figure 10).

After completing the assignment, there was a 22% increase in students who believed that AI hurts their development of critical thinking skills. This demonstrates that solely having a stated AI policy is not enough to cause students to believe that AI can benefit their academic development.

Figure 11

Control Group

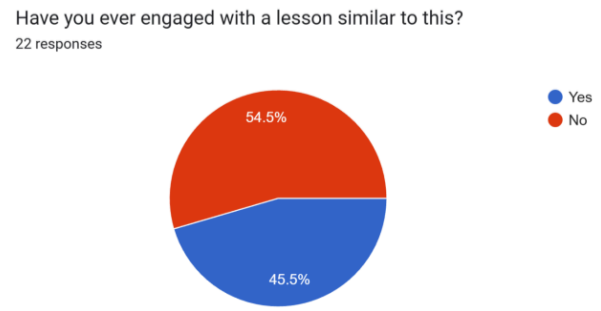
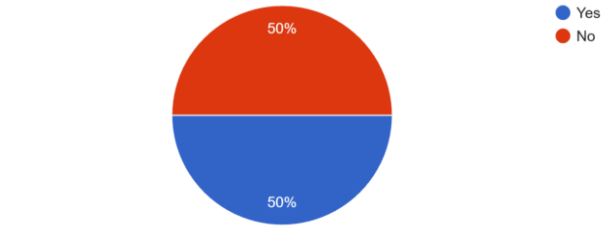



Figure 12

Control Group

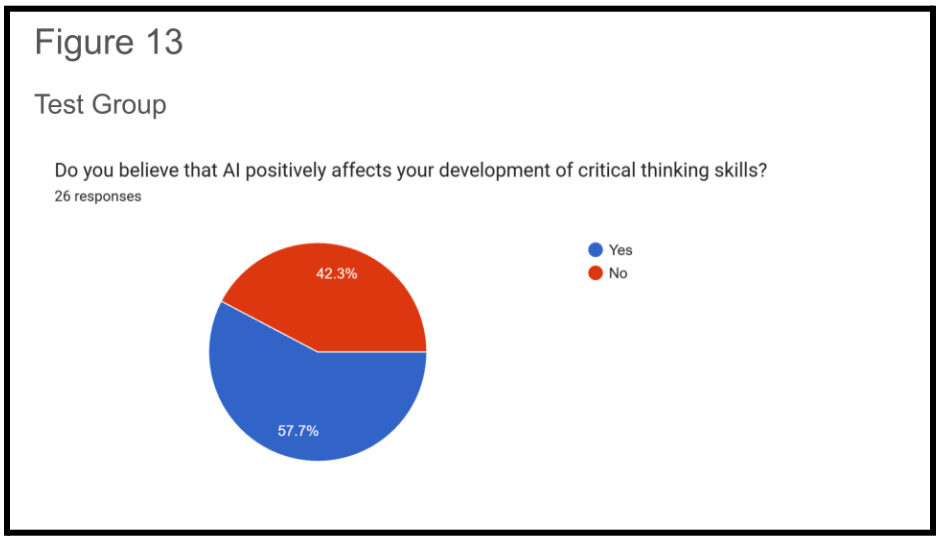



After completing the assignment, students were asked if they have ever received a lesson similar to the one they completed and if they understood how their teacher wanted them to utilize AI while completing the assignment. As shown in Figure 11, 45.5% of the students said that they have received a lesson similar

to the one they completed. Yet, Figure 12 shows that 50% of the students did not understand how their teacher wanted them to utilize AI on the assignment.

When asked a free response follow-up question on if they have ever engaged with a lesson similar to the one they received, one student said, "many of my teachers often provide minimal information with the AI usage we are allowed for the assignment." This student's response and Figures 11 and 12 indicate that despite the schools' AI policy, a lack of instruction and guidance from teachers causes students to not understand how they are expected to utilize AI on assignments. Consequently, as demonstrated in Figure 10, this lack of knowledge results in students not understanding how to demonstrate critical thinking skills while interacting with AI, which can ultimately harm their academic development.

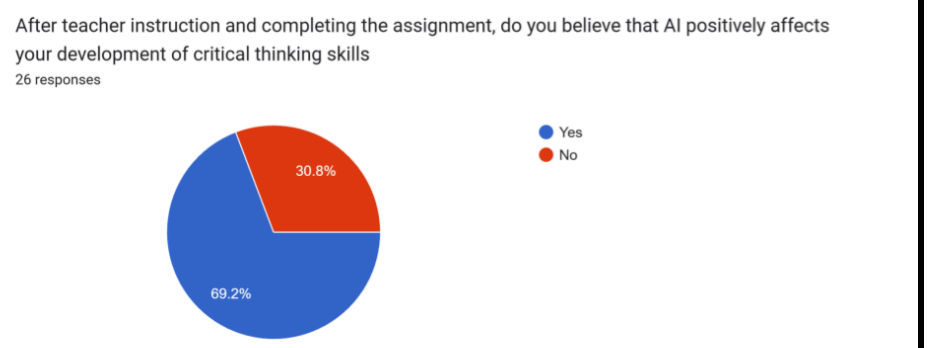
Figure 13




Before receiving any teacher instruction or completing the assignment, most students in the test group, as opposed to the control group, believed that AI positively affects their development of critical thinking skills. 57.7% of students said that they believe AI positively affects their development of critical thinking skills, with 42.2% saying that the believe AI does not, seen in Figure 13.

Figure 14

Test Group




After receiving the lesson from their teacher and being guided by their teacher on how they should utilize AI on the assignment, the percentage of students who believe that AI positively affects their development of critical thinking skills increased to 69.2%, as seen in Figure 14.

The test group saw a 20% increase in students who believed that AI positively affects their development of critical thinking skills, as opposed to the control group, which saw a 22% decrease.

A chi-square test of independence confirmed this between group difference was statistically significant. Following the intervention, test group students (18 of 26, 69.2%) were significantly more likely than control group students (7 of 22, 31.8%) to believe AI positively affects their development of critical thinking skills, $\chi^2(1, N = 48) = 6.68$, $p = .010$; Fisher's exact $p = .019$, $\varphi = 0.37$.

Because individual pre- and post-responses could be linked, McNemar's tests were conducted to assess within-group change over time. Neither group showed a statistically significant shift in belief (control: $p = .50$; test: $p = .375$), as only a small number of students changed their response.

Figure 15

Test Group

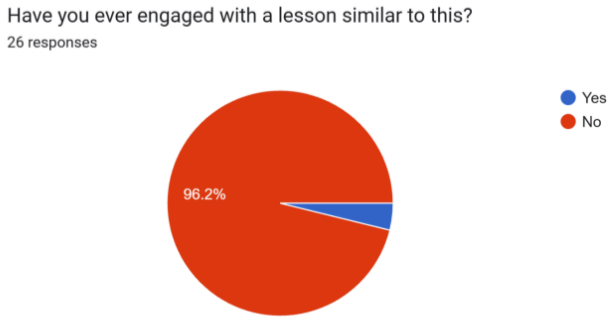
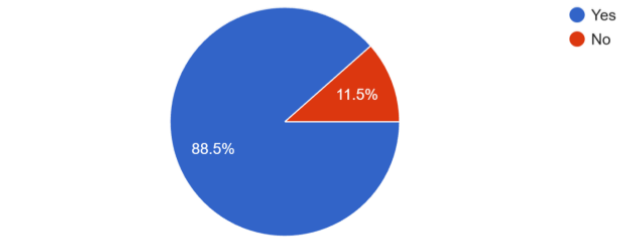



Figure 16

Test Group

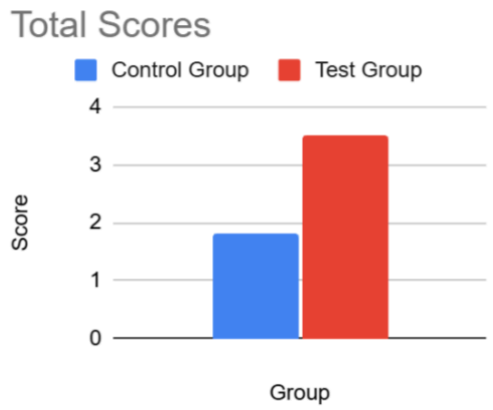



After completing the assignment, the test group was asked if they have ever received a lesson similar to the one they received, and if they understood how their teacher wanted them to utilize AI on the assignment. Figure 15 shows that 96.2% of the students in the test group have never received a lesson similar to the one they completed. Moreover, as seen in Figure 16, 88.5% of students in the test group said that they understood how their teacher wanted them to utilize AI on the assignment, as opposed to only 50% from the control group.

Test group students (23 of 26, 88.5%) were significantly more likely than control group students (11 of 22, 50%) to understand how their teacher wanted them to use AI on the assignment, $\chi^2(1, N = 48) = 8.53$, $p = .004$; Fisher's exact $p = .005$, $\varphi = 0.42$.

In a follow up free response question asking if they believed that the lesson presented helped them feel more confident using AI, one student said, "[I] learned how to promp[t] AI." Figure 15 demonstrates that most students have never received a real lesson on how they should utilize AI. Yet, after being taught by their teacher, and guided by their teacher through submission requirements, almost every student understood how they were expected to utilize AI throughout the assignment. Therefore, as demonstrated by Figure 14, when students understand how they are expected to utilize AI on assignments, they gain a better understanding of how they can utilize critical thinking skills throughout the course of their interaction with AI.

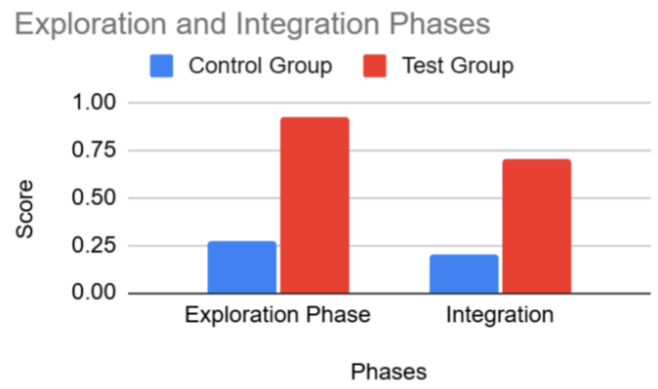
Figure 17




The scores from the rubric were used to compare students' actual demonstration of critical thinking throughout the course of the assignment in the control group compared to the test group. For the total score of cognitive presence, the average score for the control group was 1.82/4, with the average score for the test group being 3.52/4 (Figure 17).

An independent-samples Welch's t-test confirmed the test group ($M = 3.52$, $SD = 0.44$) scored significantly higher on total cognitive presence than the control group ($M = 1.82$, $SD = 1.17$), $t(26.3) = 6.42$, $p < .001$, $d = 1.97$. The very large effect size indicates the gap between groups was substantial, not the result of a few unusually high or low scorers, demonstrating that teaching students on how they should properly utilize AI, and guiding them on how they are expected to prompt AI, causes students to utilize critical thinking skills while interacting with AI at a higher level than with typical AI instruction.

Figure 18




When examining the exploration and integration phases in Figure 18, the two phases that deal mainly with the students' actual interactions with AI, the difference in scores between the control and test group is even more apparent. For the control group, the average score on the exploration phase was 0.27/1, and on the integration phase, the average score was 0.2/1. For the test group, however, the average score on the exploration phase was 0.92/1, and on the integration phase, the average score was 0.7/1.

Figures 17 and 18 illustrate that students who receive AI instruction and are guided throughout the assignment demonstrate higher levels of critical thinking through their prompting of AI than students who receive typical AI instruction.

Both differences were statistically significant. For the exploration phase, the test group ($M = 0.92$, $SD = 0.19$) significantly outscored the control group ($M = 0.27$, $SD = 0.40$), $t(28.9) = 6.95$, $p < .001$, $d = 2.12$. For the integration phase, the test group ($M = 0.70$, $SD = 0.25$) again significantly outscored the control group ($M = 0.20$, $SD = 0.40$), $t(34.5) = 5.03$, $p < .001$, $d = 1.51$.

As a whole, the results of the experiment demonstrate that without any guidance, students will not utilize critical thinking skills while interacting with AI. Through proper teacher instruction and guidance, however, students will utilize and develop critical thinking skills throughout their interaction with AI.

## LIMITATIONS

Although the researcher attempted to account for all influential factors in the surveys and experiment, limitations were still present in the study. One limitation is that the study was isolated to one school. Despite the fact that this allows for the amount of AI education the students are exposed to to remain consistent, it led to a relatively small data set when compared to all high school students in the United States. Additionally, the study was conducted in a private school, not a public school. This means that the

study does not account for the larger class sizes, and different socioeconomic statuses that affect the student body of public schools, weakening the generalization of this study's findings. With regards to the survey respondents themselves, some of the students may have had social desirability bias as the students were aware that their responses were for the purpose of a research study. As a result, some students may have answered their questions based on what they believed the study was attempting to prove, rather than based solely on their own opinions. For the experiment, however, the students were unaware of which group they were assigned to, weakening the effect social desirability bias may have had on their responses. Despite these limitations, the results were consistent amongst the participants indicating that even by accounting for these factors with a larger sample size and the lack of knowledge from participants that they were participating in a research study, the study would most likely yield similar results.

A further limitation concerns a pre-existing difference in baseline attitudes between the two groups. Before the intervention, 57.7% of test-group students already believed AI positively affects critical thinking, compared to only 40.9% of the control group (Figures 9 and 13). Because the groups began from different starting points, the significant post-intervention difference in beliefs (Figure 14) cannot be attributed to the intervention alone. To assess this, individual pre- and post-responses were linked and analyzed using McNemar's tests, which revealed that neither group's shift in belief was statistically significant, as few students changed their stated response. The belief findings are therefore interpreted as suggestive rather than conclusive, and the study's conclusions rest primarily on the cognitive presence rubric scores, which is a direct behavioral measure of critical thinking that showed large, statistically significant differences between groups and is unaffected by the groups' differing baseline attitudes.

## FUTURE DIRECTIONS

The researcher is currently working on expanding the study to broaden the data set, and expand the implications. 82 middle school students from a private school were tested using the previous study, and the results are currently being analyzed to determine the impact that better AI instruction and guidance can have on middle school students. Additionally, the researcher is working on expanding the high school data set from not only private schools, but to public schools as well. The researcher is reaching out to two public high schools to conduct the experiment to further validate the results, and expand the implications of this study to public schools. Expanding the research scope will also mitigate one of the limitations of a small sample size in one school. Additional researchers can further expand on this study by testing if different factors such as socioeconomic status affect the results, and by testing the effects of schoolwide implementations of better AI instruction and policies. Future researchers should administer proper AI professional development to an entire faculty of teachers, and have them implement the lesson into their assignments throughout a whole school year, while surveying and grading students based on how their critical usage of AI improves throughout the entire school year. By doing so, researchers can gain a better understanding of the effects of proper AI training and guidance on students over the course of an entire school year.

By expanding this research, the results of this study will be able to be applied beyond just private schools, but to public school district policies and teacher professional development as well. Both private schools and public school districts should implement the results of this study to create new, and revise current, AI policies and teacher professional development in order to allow for students to utilize AI in a manner that supplements their intellectual development.

## IMPLICATIONS & CONCLUSIONS

The results of this study demonstrate the importance of proper teacher training on how students should properly utilize AI, and the importance of student guidance on how to utilize AI on each assignment. Due to the widespread usage of AI amongst students, teachers should not avoid utilizing AI; rather, they should embrace it. If students are left to decide for themselves how AI should be used to complete an assignment, they will utilize AI as an easy way out, and not as a tool to help them critically think. Moreover, simply having a broad AI policy or even a one time lesson is not enough to educate students on how they are expected to utilize AI on assignments. Teachers must be taught how each level of student AI interaction can be incorporated within their specific assignments so that they are able to design assignments to guide students on how they are expected to interact with AI. Specifically, this should be done by holding students accountable for their use of AI through requiring students to submit the logs of their AI interaction, an open ended prompt, and requiring students to ask detailed follow up questions about AI's response. As a result, AI usage should not be built around an assignment, rather, the assignments should be structured around how students are expected to utilize AI. Overall, through proper teacher education and training, educators can properly guide students towards viewing and utilizing AI not just as a tool of efficiency, but a thinking partner.

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