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Use of Generative AI Among High School Students

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ABSTRACT

Generative AI has seen an explosive rise in its usage since the COVID-19 pandemic in 2020 (McKendrick, 2021) especially in the field of education. However, its impact in a high school setting, especially its usage amongst high school students, is an under-researched area. In this paper, we conducted exploratory qualitative research with high school students to explore how students use generative AI. Through the use of thematic analysis, we see both the positive and negative impacts of AI amongst high school students. Our findings denote that while generative AI saves time and assists in the initial brainstorming, it also encourages complacency in the learning process, especially in developing critical thinking skills among young adults. Through this paper, we identify future research directions of generative AI and the practical implications for its use among young adults.

Introduction

Developments in artificial intelligence (AI) have led to a surge in its usage in virtually all aspects of society and are thought to have had a nontrivial impact on the field of education (Chen et al, 2022). The widespread attention that Generative AI has gathered has led to the renowned Marshall School of Business at The University of Southern California offering a BS in Artificial Intelligence in Business as a course for undergraduate students. The implementation of such courses by universities for undergraduate education and the development of AI-enabled tools (Park, 2019) demonstrates how AI technology is being increasingly integrated into education (Chen et al., 2022). Research regarding the impact of AI on high school students remains unexplored. With more and more students placing greater value on their transcripts and grades, using Generative AI for assignments and learning has become widespread. Especially for high school students who spend their final 4 years of school working on their profiles and credentials, an increasing workload and need for perfection pushes them toward the convenience of Generative AI applications. This is why it is pivotal to research the impact of generative AI on the learning ability of students.

Generative AI is said to complete tasks that typically require human knowledge such as language understanding, decision-making, and speech recognition. As this technology has advanced, it has become more adept in answering education-related queries and providing responses suitably and productively, increasing its popularity among younger high school students (Bochnairz, et al., 2021). Some schools of thought advocate for using AI in education (Lunkin & Holmes, 2016). However, other scholars have warned about the loss of learning among students (Khan et al, 2023). Furthermore, AI's role in aiding high school students and impacting their critical skills is still a matter of speculation. Scholars have urged research on the role of generative AI among students and have explored topics surrounding its impact on students (Lee et al, 2021), especially those in high school (Sun & Zhou, 2024).

Scholars point out that students are at the core of a high school learning process (Gbollie & Keamu, 2016). Pintrich et al. (1994) have demonstrated that higher levels of self-regulated learning are achieved when the tools to access learning are given to students. Further, Gbollie & Keamu (2016) demonstrated that the tools and technology available to students can enhance their learning. Therefore, there is a growing pedagogical need to comprehend how technology helps students develop their capabilities and what factors might impede their learning skills (Zimmerman, 2010). However the use of new technologies may be viewed with fear and may prevent high schoolers from

developing self-regulatory mechanisms to enhance their learning skills (Adams, et al., 2017). Therefore, studying student learning behavior predicated upon the use of technology such as AI is required to understand their impact on students' learning abilities and their school performance.

This study aims to investigate the use of Generative AI among high school students. The study explores three research questions:

RQ1: How do high school students use generative AI in their school work?

RQ2: How does generative AI impact students?

RQ3: How do students perceive their teachers' view of their use of generative AI?

Given the exploratory nature of this study, we use a qualitative methodology, where semi-structured interviews are used to collect data from high school students. To analyse the results, we use Bloom's taxonomy of learning (Armstrong, 2010). Bloom's taxonomy contains six hierarchical objectives. Each step of learning builds on the former, in a cumulative progression from recall, the first step of cognition, to abstraction, the highest level of abstraction (Ramirez, 2016). The framework embraces the idea of increasing thinking complexity in learning. It implies that a student needs to have processed the information at preceding levels of complexity to attain higher levels of thinking, such as synthesis or evaluation. Bloom's taxonomy directly relates with student learning and is therefore an appropriate lens to understand the impact of AI on high school student learning.

Following this introduction, the paper delves into methodology and presents the results of this study. The paper then discusses the results and concludes with practical implications of the study.

Methodology

Participants

Purposive sampling was used to invite interviewees. We used our personal networks to contact these students to participate in the study. To keep their identity private in this paper, they were given the pseudonyms Person A, Person B, Person C, Person D, and Person E see *Table 1*. Four of the students were female and one was male. Their ages ranged from 15 to 17 years old and all belonged to grade 11 studying in the IBDP curriculum. They all had a diverse set of subjects ranging from economics, geography, biology, physics, and chemistry. All the students were from a single school in Mumbai.

Table 1. Participants information

Name	Age	Gender	IB Higher level subjects	IB Standard level subjects
Person A	17	Female	Maths AA, Physics, and Economics	English, Chemistry, and Spanish AB
Person B	16	Female	Maths AI, Chemistry, and Economics	English, Business, and Spanish AB
Person C	17	Male	Maths AA, Physics, and Chemistry	English, Economics, and Spanish B
Person D	16	Female	Maths AA, Chemistry, and Economics	English, Computer Science, and Spanish B

Person E	16	Female	Maths AI, Biology, and Economics	English, Geography, and Spanish B

Data Collection

All five interviewees were contacted via phone call or WhatsApp. Once their participation in the study was confirmed, we set up a date and time for a meeting over Zoom. The interviews were all conducted over Zoom. All participants were asked the same group of questions which are attached in *Table 2*. Based on their responses, follow-up questions were asked. The interviews lasted for an average of 20 minutes.

Table 2. Interview protocol

Question number	Question
1	What are your top goals that you wish to achieve from school education and how does AI help you achieve that?
2	How often do you use AI? [Frequency]
3	What kind of schoolwork do you use AI/ChatGPT for?
4	Name two or three areas in which AI/ChatGPT has been useful in your learning at school. How often have you personally found it useful?
5	Are you aware of ChatGPT's sources?
6	What challenges have you faced with the information that you have got from AI/ ChatGPT?
7	How do you know that the information is credible and usable? Are there any checks that you use?
8	What is the opinion of the usage of ChatGPT amongst your friends?
9	How do your teachers and school administration view the use of generative AI?

Data Analysis

All the interviews were transcribed and analyzed using thematic analysis (Braun & Clark, 2006). The participants' responses were first analyzed through open coding. The two authors met after every two interviews to debate the emergent themes and the axial codes were developed. Emergent axial codes were time given to do the assignment, importance of assignment, grades, aim/grade ambition, availability of source material on the internet, perception of the difficulty of a given assignment, and subject inclination against the usage of AI for the assignments. Usage of AI was measured using the number of assignments AI is used for and the frequency of usage.

Findings

To explore the three research questions, we analyzed the interviews and collected responses from each person for each question.

Use of AI Amongst High School Students

Participants spoke about the various uses of AI in their learning. While they were not required to use AI as a part of their school curriculums, the students found the usage of AI as interesting and novel. This is evidenced by Person C who spoke about using "AI as an alternative search engine." They also shared that AI was easier to come up with ideas because it gave responses directly as opposed to search engines like Google which only gave links to websites, making the brainstorming process longer and more time-consuming. Hence Person A, B, and C also used AI as an alternative for search engines. Person C expressed "I can research topics I like more deeply because generative AI will give accurate and relevant answers, unlike Google which will give, which will just recommend websites with keywords similar to my question."

Table 3 summarizes participants' responses on the different ways AI affects their learning.

Table 3. Participant responses to how AI aids students in their learning at school

Responses	People with the response
Can be used for mock testing	Person E
Used for Brainstorming	Person A, Person B, Person D
Alternative Search Engine	Person A, Person B, Person C. Person D
Assists in understanding topics	Person C, Person D, Person E
Helps to structure and link ideas	Person A, Person B
Used for error detection	Person C
Overdependence on AI leads to a lack of understanding	Person A, Person D, Person E
Summarises information	Person B

According to three participants, Generative AI was beneficial in brainstorming when stuck with an assignment and unsure how to begin. Person A shared "*Once I have my start, I know what to go ahead with, and then I can continue everything*". Person B shared a similar sentiment "*It's really useful when you can just brainstorm using AI*".

A big positive of AI for students in their learning was its assistance in explaining topics that students struggled to understand. For example, Person D used it for one of their Higher-level subjects, "*I was confused about the advantages and disadvantages of a recession because there are obvious disadvantages, but I wasn't really sure about the advantages. So in order to get a few points and advantages, which weren't mentioned in my textbook, but I still thought I needed knowledge for the exam, I used ChatGPT.*"

Similarly, Person B also expressed that they used Generative AI like Perplexity to simplify and summarise difficult topics, saying "*AI simplifies things*."

While all five participants shared the benefits that AI had on their understanding and completion of school assignments, many also mentioned how it was negatively affecting their education. They shared that overdependence on AI led to a lack of understanding of concepts. Person A personally felt that they used AI in subjects where the grades weren't as important to them leading to overuse of AI in that specific subject. They said, "*I use it (AI) very often. Because we're doing International Baccalaureate, subjects like Theory Of Knowledge (TOK) and Creativity Activity Service (CAS) are not something I want to give my attention to because I'd rather give it to my subjects*." Person E had a similar opinion on the drawbacks of AI, "*I think it's beneficial to an extent, but I also think that some students that I've seen or spoken to use it extensively to the point where they don't even know what the topic is about or what they're researching on because they just copy paste it off ChatGPT*."

Impact of AI on Students' Work: Students' Own Perception

Participants had mixed responses about the effect that AI had on school work amongst high school students, highlighting both its negatives and positives.

There was a universal consensus among all five participants was Generative AI's biggest impact was in the time it saved for students and the efficiency with which it provided answers. Person C, explicitly agreed with this by saying, "*With generative AI the main purpose of it, I think is just to simplify things and sort of cut down on the time it takes to do something*". They mentioned several ways in which Generative AI saved time. Some reasons included collecting all the information the participant needed and giving it to them in one place, adapting the responses to what the participant needed, and summarising information for their content-heavy subjects like business and economics. With the participants being in the 10th and 11th grades, the time-saving assistance AI provided also helped allocate time to other more important tasks. Person E shared, "*My main goal is to do well in IB and get into a good university and get good placements. And I think ChatGPT really helps because sometimes we're flooded with a lot of work and ChatGPT can help make the work faster to complete like it summarizes things and it can help with getting information more quickly than searching through the internet.*"

Person C also shared that their usage of AI was like a time management strategy saying, "*It helps me achieve seemingly meaner tasks faster and more efficiently. And hence, I have time for the more complex tasks that generative AI at this point in time may not be able to achieve*." They shared how they used Generative AI's time-saving skills to allocate their time to tasks that Generative AI could not help them complete. Generative AI helped them streamline their tasks based on importance.

However, the participants also shared the negative impacts that Generative AI had on them and their classmates. One such impact was the unfair advantage that AI gave to students who used it. Person A shared an experience of the same in their English class, " *Some of them (classmates) misuse it (Generative AI), I think. This same English presentation, this guy got AI to fully generate everything for him, and he ended up scoring really well because our teacher did not actually check if it was made by AI or not.*"

Participants also shared that dependence on AI led to complacency and laziness in finishing work themselves. In sharing this Person C said, "*The way Generative AI affects that (their future goals) is maybe I might get a bit too reliant on it because it simplifies everyday tasks such as writing essays and writing long answers which I may feel are too monotonous. That causes me to lose the work ethic and then I may become a bit lethargic in the future and avoid doing work simply because I'm not used to doing that much work because of the assistance of Generative AI.*"

Since all five participants were doing the IBDP, a popular thought shared by them was how they saw themselves using Generative AI in subjects that held less value to them and weren't their main 3 HL subjects. This included the 3 extra components: CAS, Extended Essay (EE), and TOK, and compulsory subjects like English. Due to this, they found themselves streamlining the subjects they were focussing on. When asked about which subjects they find themselves using Generative AI Person A said, "*I use it more for extra parts like CAS, TOK. And then from my subjects, it's just English that I've used. English, TOK, and CAS.*"

All the responses are collated in *Table 4.*

Table 4. Participant Responses to how AI affects schoolwork amongst high school students

Responses	People with the response
Saves time	Person A, Person B, Person C, Person D, Person E
Helps complete work in less interesting subjects	Person A, Person B
Streamlines their focus to subjects they like	Person A, Person D, Person E
Reduces research skills	Person B, Person D
Results in complacency to do work	Person A, Person C
Responses lack details and a personal touch	Person A, Person C, Person D
Students using AI have an unfair advantage	Person A, Person E

How Do Teachers View the Use of AI In Schoolwork?: Student Perception

Participants were asked a range of questions to better understand their thoughts on the opinions on how their teachers view the usage of AI. They had the unanimous opinion that most teachers view the use of Generative AI amongst students negatively. However, to explain this opinion Person C used the metaphor of a calculator saying "*So as of now, I think that the majority of faculty all around the world not only view ChatGPT and generative AI as a negative thing because they believe that it hinders the learning of the student. However, I believe ChatGPT is like how calculators were in the past where it just eliminates the need for people to do menial tasks and instead focus on tasks that require a human touch. As I said before, the analysis of solving problems requires an intuitive understanding of the problem itself. I feel ChatGPT is a tool however I do not believe that a lot of the faculty understand that as of now and believe instead that it's a crutch that you can use to just get ahead and bypass responsibilities*."

In their response, Person C brought up another common opinion that the participants had about how their teachers viewed the usage of Generative AI. According to the participants, teachers think that Generative AI is a method for students to get out of doing their work and it in turn takes away from their learning. Person E said, "*They (teachers) might believe that the work is not affecting the students in a positive way because a lot of students try to take the easy way out and use ChatGPT and they end up not learning anything in the process*." Another opinion on this was that teachers think the usage of Generative AI makes students lazy and hampers their ability to think creatively. In support of this, Person B said, "*I think most educators would probably be against it, especially if they're sort of, you know, old fashioned, they probably think, you know, it's making us lazy or like we're not researching enough on our own or just, you know, it's making it too easy for us*."

Participants also shared that some teachers view the usage of Generative AI positively depending on the kind of task it is used for. It was Person B who said, "*I definitely have seen some teachers, you know, use AI or encourage students to use AI, but only for specific purposes: brainstorming or like giving you that little initial push.*" Person A also mentioned how their teacher was using Generative AI for her tasks such as writing Letters of Recommendation for students for their university applications when they did not have enough content to write the letter. This showed that since the usage of AI has become more widespread, some teachers and educators support its use and some don't. In fact, Person D and E shared that teachers are now allowing students to use Generative AI because IB itself released a list of guidelines on how to disclose AI usage in tasks. Person D shared, "*I think one thing that the IB is doing is that they've allowed the use of AI as long as you cite it with the prompt that you use. So I think that will kind of allow students to use AI and use ChatGPT and discover how to use ChatGPT productively because obviously, a student*

can't just copy-paste the entire answer of the prompt and then cite ChatGPT. They're going to have to think of more. They're going to have to think of more unique prompts and prompts that will allow them to develop on and prompts that they can work on later and then cite that."

Their response brought up another point that teachers struggle to regulate the usage of AI and hence view it negatively. In response to the guidelines made by IB to help monitor AI usage, Person E said, "*But I think it's also very hard for teachers to make it a level playing field because they're also much older and it's a very different generation so sometimes it might be difficult for them to even recognize when a student has used ChatGPT or not.*"

Table 5. Participant responses to how they think their teachers view the usage of AI in schoolwork

Responses	People with the response
Teachers use it for their tasks	Person A, Person B, Person C
Teachers struggle to standardize the use of AI	Person A, Person D, Person E
Teachers enforce AI usage guidelines put in place by IB	Person D, Person E
Teachers think it makes students lazy	Person B, Person C, Person E
Teachers think it is a tool that takes away from the learning	Person A, Person C, Person D, Person E
Teachers need to enforce more rules and guidelines	Person C, Person D, Person E

Discussion

This paper contributes to the understanding of the use of generative AI for learning among high school students. The purpose of the paper was to understand the impact on student learning by exploring where and how high school students are using Generative AI. Bloom's taxonomy (Armstrong, 2010) underscores the cultivation of higher-order thinking skills and creativity (Villarroel et al., 2019) – ensuring a comprehensive and robust approach to the evaluation of the learning skills of students. Our findings support Halaweh's (2023) and Cooper's (2023) observations about AI's capability to generate reflective and knowledge-based responses and emphasize generative AI as efficiently synthesizing knowledge. In line with this model, our study finds that students use generative AI as time-saving and a better search engine. Further, this is in line with Chiu et al.'s (2023) assertion of AI potentially replacing student efforts in memorization and factual processing tasks.

Interviews with high school students themselves revealed their own opinions, advantages, and disadvantages that AI usage has on their education and critical thinking skills. Their usage of AI mainly comes from the ease with which they can use and access applications like ChatGPT. Learning requires students to structure information and understand schemata (Armstrong, 2010). However AI is expected to "do the work" for them instead of students putting in the effort to learn and understand the work, it can impede their learning and academic success in the long run as the AI-driven output may not reflect the student's true learning and understanding (Chen and Lin, 2024). Findings in this paper also revealed the reaction that teachers and educational administrations have to AI usage and how educational boards like IB are changing their guidelines to adapt to the developments in AI.

Practical Implications and Conclusions

AI is a strong tool to have for students but it needs to be regulated so students know how to use it. As mentioned by several of the participants during the study, schools are unable to correctly regulate AI usage leading to some students gaining unfair advantages and overuse of AI in their assignments. Schools need to implement policy guidelines so there is a safe usage of AI and it does not harm the learning of students. This study focussed on the impacts and implications of Generative AI on high school students and contributes to understanding the current uses, limitations, and potential changes that can be made to AI sources so that they can contribute more productively to the high school education process.

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