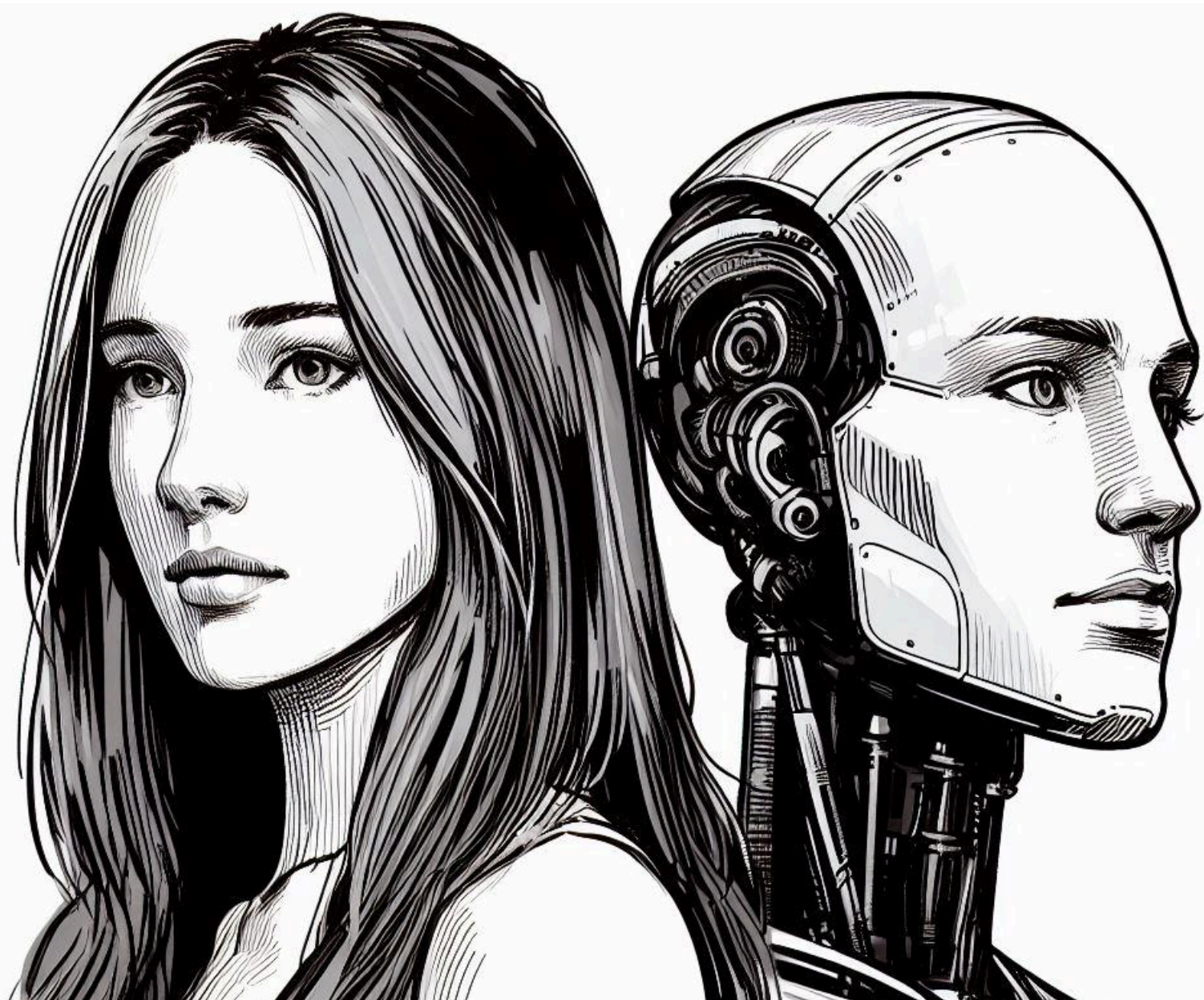


Pearson Edexcel Level 3 Extended Project | EPQ

Navigating the societal impacts of Artificial intelligence: A focus on education, generative AI and beyond

By Majdi Jaigirdar

Centre number: 34679



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Abstract

This dissertation explores the growing use of generative artificial intelligence (GenAI), particularly large language models (LLMs), in the field of education. The aim is to surface the potential benefits and challenges associated with the integration of GenAI in teaching and learning practices. A focuses on two main areas: the impact of GenAI on students' academic abilities and the use of GenAI by educators.

This dissertation examines the reliability and reputation of secondary sources, including governmental reports, policy papers, and articles, shedding light on how GenAI is currently being used and perceived in education. Additionally, primary data is collected through a survey conducted among students to understand their views and experiences regarding the use of GenAI for academic work.

The findings reveal that while GenAI offers several advantages, such as quick access to information and the facilitation of certain educational tasks, there are concerns regarding academic integrity and students' overreliance on AI-generated content. The survey data suggests that while some students engage in copying answers directly from AI, others use GenAI as a guide or support for their own work, enabling them to better understand complex concepts.

Moreover, the study explores the use of GenAI by educators, highlighting how teachers can leverage these tools to create personalised lesson plans, automate tasks, and provide additional resources for students. However, caution is warranted, as inaccuracies and biases in AI-generated content may occur. Teachers should maintain subject expertise, exercise critical judgement, and rectify any potential mistakes made by AI to ensure the credibility and accuracy of information provided to students.

Overall, the dissertation concludes that the integration of GenAI in education requires careful navigation. While there are concerns about the impact on academic integrity and skill development, responsible use of GenAI can enhance teaching and learning processes. The Department for Education recognises the potential benefits of GenAI and encourages its use in education, accompanied by guidelines and best practices. Ensuring a balance between leveraging AI's capabilities and nurturing students' critical thinking and independent learning skills will be crucial for the future of GenAI in education.

Introduction

In this dissertation I'll be discussing the developing and growing use of artificial intelligence in education and teaching, specifically the use of generative artificial intelligence (Generative AI, GenAI, etc) and the potential future uses and scenarios. Recently in the past few years there has been an ongoing development race to make more advanced AI systems and programs spearheaded by different companies and organisations such as Google Deepmind, IBM, OpenAI, Microsoft, Meta and many other tech companies. One of these advanced AI is LLMs (large language models). An example is OpenAI's ChatGPT, the chatbot that took the tech world by storm in late 2022 and has been growing in popularity since.

In my dissertation I'll discuss this boom in popularity, especially among students of all ages and levels. How students utilise services like ChatGPT, SnapAI etc for school work, and if their use of AI is constructive for their education or damaging their education and academic abilities. For example, a major concern of GenAI on education is its use in facilitating plagiarism in education, helping children cheat and cause unfairness to those who have done genuine work. Along with this, I'll research and discuss the use of GenAI by educators and see and understand how teachers and other educators are using AI for their benefit, and if their use of AI is also constructive for their teaching and career or damaging their students education, academic abilities and their own teaching abilities.

To do this dissertation I'll be using various sources. However, as Gen AI is only new and still developing, there are a lack of sources, data and information on the use and impacts that this new era of AI is having on education, and society as a whole. Due to this, I'll be conducting my own survey to get further information on the use of AI and the perceptions of AI. This primary source data not only will help to get an understanding of GenAI where there isn't any data, but will also let me gather more designed data made for this dissertation in particular.

The reason for me doing this dissertation is for my interest in technology, AI and because of the growing use of AI by my peers and the lack of a guide or discussion of the use of AI among students and education institutions and impacts it could have. The positives and negatives of AI need to be discussed, and there are correct and positive ways to use AI and can enhance education and there are ways that can undermine someone's education.

I believe in this new era of Generative AI, there needs to be clear education and discussion on the usage of it by educators, government and employers and especially as it continues to grow.

Literature review

In this review I'll discuss the reliability, reputation and factuality of my secondary sources I have collected to write my dissertation. I'll also be analysing and reviewing my own dissertation survey on the subject of AI completed by a number of participants, and also discussing the topic of AI, GenAI and education.

Secondary sources of data

When starting my dissertation, I read multiple articles and sources on the topic of AI. My dissertation was going to be on the general subject of the safety and impacts of AI on humanity. However, reading articles, posts, news, and other sources, I realised the subject of AI and the impacts it has is too broad and has been over-saturated. For this reason I decided to focus more on the impacts of Generative AI on education, how it's being used and what the future of AI in education will look like.

1. Generative AI in education - Educator and expert views - GOV.UK

URL:

https://assets.publishing.service.gov.uk/media/65b8cd41b5cb6e000d8bb74e/DfE_GenAI_in_education_-_Educator_and_expert_views_report.pdf

Author: The Open Innovation Team and Department for Education

Publication Date: January 2024

In this recent report written by the 'The Open Innovation Team and Department for Education', published by the UK's Department for Education, they talk about the interest in and use of GenAI has increased over the last year and how AI is being utilised in education. They have collected insight from teachers and other educators by interviews and surveys, and have collected data from students and parents using qualitative and quantitative sources. They sourced data from multiple educational institutions, a number of interviews with experts and the educational tech industry.

The report covers how the educational sector has respond to the growth in GenAI, the possible applications and use of GenAI in education, the reported impacts and benefits of GenAI in education, the issues and risks around adopting GenAI, and the support the education sector would like to receive from the government.

The report features multiple case studies from schools and teachers implementing AI in their education or workload, and educational tech companies using AI to better help educate students. They also survey students and parents in various education levels, gaining an understanding of how many students use GenAI.

In the DfE report, they cover various areas of GenAI being used by teachers and educational institutions, and explore how GenAI can better help educators with their work by helping them create lesson plans, class resources and offload work. They also stand firm that teachers must use GenAI safely, in compliance with GDPR and use it appropriately and retain knowledge on their subjects.

While the report provides a great source and understanding on the use of GenAI among educators, it lacks in-depth reporting on the extent and use case that students are using GenAI, such as unethical use of GenAI being used to plagiarise and cheat, or even the constructive use case of GenAI. Further, It also fails to explain what the DfE and HM Gov believes are appropriate use of AI by students and teachers, and leaves that understanding to educators to figure out. It's likely though, in some months or years, the DfE will publish guidelines on how GenAI is to be used in education, and this report along with others will be used to come to that conclusion.

Overall, this expansive and well written report from the DfE is a great source of data to help with my dissertation, as it features multiple points and sources from a number of teachers, schools, tech industries and students. Being published by the UK's DfE, a government body, it's very reputable and can be relied on to draw conclusions on how GenAI will be used in the future in this sector.

2. Generative artificial intelligence (AI) in education - GOV.UK (www.gov.uk)

URL:

<https://www.gov.uk/government/publications/generative-artificial-intelligence-in-education/generative-artificial-intelligence-ai-in-education>

Author: Department for Education

Publication Date: 26 October 2023

This is another article published by the government, a policy paper on the use of generative artificial intelligence, including large language models (LLMs) like ChatGPT or Google Bard, in the education sector. This paper is in response to the boom and rise of these new technologies, and the UK's government's approach to adopt the next generation of safe AI. The report seems to be a shallow guidance and quick explanation of GenAI and a quick policy response to an emerging use of AI in education for educators.

The policy paper explains what GenAI is, how they work and what they can do. Explaining the growth of them, the content they can create (text, images, videos and audio) and the opportunities for the education sector they can bring when used effectively. Such as freeing up teachers' time and creating useful resources. The paper also lists the issues with the use of AI generated content, such as it being unreliable, inaccurate, biased and other issues relating to GenAI content.

Similarly with the previous report published by the Department for education, it's focused primarily on teachers using AI and provides general guidelines for teachers to follow but doesn't instruct on how pupils should use AI in a safe and beneficial manner for their education.

3. Other sources of data

In addition to the comprehensive sources previously discussed, my literature review delved into supplementary data resources that, while not as prominent, significantly helped my dissertation's discourse on AI and education. These other sources served as invaluable complements, offering nuanced ideas and filling gaps where primary data was scarce. Their inclusion not only bolstered the depth of my analysis but also provided essential support for crafting a comprehensive discussion on the intersection of GenAI and education.

Primary sources of data

1. "EPQ: Research & survey on AI (artificial intelligence)" - Google forms survey

Due to this new era of generative artificial intelligence being so recent, there is a lack of many rich sources, articles or data going into depth of GenAI in education. For this reason I decided to make my own survey to collect qualitative and quantitative data on the subject of AI to help me write my dissertation to be able to analyse the data and draw findings and conclusions, helping to understand the impact that GenAI is having on education and society as a whole.

Using my own survey allowed me to ask questions that are specific for my dissertation, this means that I can raise more points and discussions that will be more in depth compared to solely relying on secondary data, it allows me to better discuss the impacts that GenAI will have on education. For example I'm able to ask much more specific questions such as should *"Students should be allowed to use AI services like ChatGPT in their NEA, EPQ, dissertation, coursework and other non-exam graded work"*. Using only existing data, it's unlikely to find a question that relates specifically to level 3 UK qualifications of non-examined assessments, which would make my dissertation much more broad and less in-depth. Making my own survey means that I can have a mixture of quantitative and qualitative questions, allowing me to use numbers to draw general conclusions and qualitative data to get a better understanding of participants' views. I'll be sharing my survey with my peers in person and on online platforms such as instagram.

60 participants took part in my survey, which is a large number of participants to draw reliable and generalisable conclusions of how AI is perceived, used and thought of by the general population. However, as this survey is shared mostly among my peers, there is a lack of age representation, and culture representation. Majority of the participants were aged 17-18, nearly all being in the UK, speaking English, etc. Meaning that not all demographics were represented and there may be unintended bias in my data.

Discussion

Introduction to discussion

The sphere of Artificial Intelligence (AI) - a branch of computer science that explores the creation of intelligent systems able to perform tasks requiring human intelligence - has witnessed unprecedented growth and permeation in the modern world. Enhanced computation power, advanced algorithms, and a wealth of data have allowed AI to expand beyond its traditional realms, catapulting society into an era where everything from our smartphones, cars, to healthcare and finance systems are imbued with features of AI ([Where Do Generative AI Models Source Their Data & Information? | Smith.ai](#) [20/02/2024]). And now, a new era of AI has started, generative AI. While AI has typically been in the background of systems and programs, this new generative AI is on the front lines and in the hands of the average person.

Generative artificial intelligence (*GAI*, *genAI*, *generative AI*) is artificial intelligence capable of generating text, images, video, audio or other media/data using advanced algorithm models, usually done by user entered prompts. Generative AI models learn the patterns and structure of their input training data and then generate new data that has similar characteristics the user is looking for. ([Large Language Models pose risk to science with false answers, says Oxford study | University of Oxford](#) [20/01/2024])

This seemingly sudden boom and increased interest in AI is partly due to services such as ChatGPT, a large language model (LLM) made by OpenAI, and many other popular LLMs such as Google's bard (*now rebranded to Gemini*) and Meta's LLaMA (*previously Facebook*). It allows users to 'talk' to a computer using natural language such as speech or text to prompt the AI model to generate a response back. While its idea is similar to a digital assistant like Apple's Siri, Amazon's Alexa or Google's assistant (*Hey Google*), it's much more advanced and capable. Ask Siri, Google or Alexa this 'What are the distinctions between sunflower oil and olive oil, and could you outline their respective advantages and disadvantages?' and you'll probably get a very basic response that doesn't outline their advantages, or "Here's what I found on the web" or "Sorry I'm not able to do that". Now ask that same question to ChatGPT, Google bard or other LLM and it can give u comprehensive analysis on the both, outline and evaluate the differences, write the advantages and disadvantages, and can even put that into a table format for you. These new generative AI tools being so capable and useful, is what has given them attention and increased their usage.

Like the name suggests, these large language models have been trained on large amounts of human language (*written text language*) and the 'model' in LLM means a complex algorithm or formula that allows for predictions. In all, LLMs are a complex mathematical formula that allows them to predict what words to output based on previous words before it. This could be simplified to and compared to autocomplete/ predictive text that's on our smartphones and suggests the next word for us with context. While predictive text is also using algorithms and machine learning (a form of AI), it's much more simpler in that it only uses the last couple of words for context, suggests only one word, and it hasn't been trained on large amounts of written text as compared to LLMs.

This last difference is what makes it very different and unique. LLMs are trained on a vast amount of data from various sources, books, websites, newspapers, articles, blogs, chat messages and more ([Where Do Generative AI Models Source Their Data & Information? | Smith.ai](#) [20/02/2024])

([Large Language Models pose risk to science with false answers, says Oxford study | University of Oxford \[20/01/2024\]](#)).. This *training* is done by teaching the model to predict what words are to come next by understanding those sources. This allows it to know that an accurate way to complete the sentence “The cat sat on the” would be with “floor”, “table”, etc. This large training source also means that it holds a large amount of knowledge and can give information on a variety of topics and subjects as it's been trained on academic papers, news papers, textbooks, historic diaries, and articles.

For this reason of being so knowledgeable on academic work, Generative AI LLMs has been so useful for education for students and teachers alike. One of the biggest users of ChatGPT is students, and the biggest use is for academia.

These LLMs allow students to ask complex prompts such as ‘*What were the varying perceptions of Winston Churchill's leadership during World War among the British public?*’, ‘*explain the different coastal formations for GCSE geography.*’, ‘*What is Colorimetry in science?*’ and more prompts and questions for these LLMs that give knowledgeable, useful and understandable informative responses for students.

This encapsulates the questions of how generative AI is changing, impacting and being used in education, what will the future impacts be?

Discussion

“Navigating the societal impacts of Artificial intelligence: A focus on education, generative AI and beyond”

The use and impacts of generative AI in education

The use of GenAI has led to an emerging trend amongst students using these sophisticated resources not as mere supporting tools but, controversially, as an aid for plagiarism by having the AI complete their academic work entirely. This raises the vexing question of academic integrity and whether the use of AI nullifies the student's learning process and impedes the evolution of their intellectual abilities.

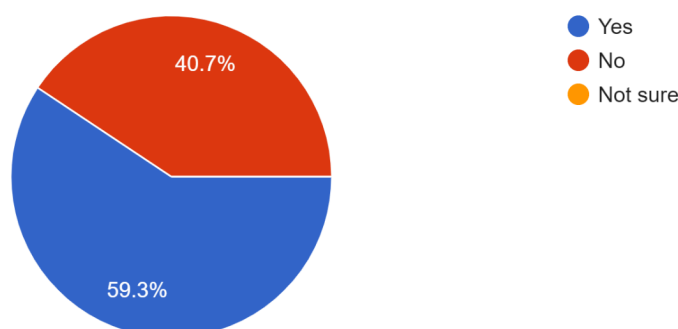
This pattern is supported by data illustrating a noticeable surge in the utilisation of ChatGPT during the academic terms and a conspicuous dip during the summer holidays, showing that a significant amount of users are students using chatGPT for education ([ChatGPT traffic spikes as students return to school | Mashable \[20/01/2024\]](#)).

Data collected from a survey made for this dissertation, further illuminates the presence of AI in education. The results indicate a significant majority of approximately 59.3% of respondents, equating to 35 participants, have utilised AI tools such as ChatGPT, Snapchat's My AI, Bing's chat (*now Microsoft copilot*), Google's Bard and other AI assisted services, in their academic work.

(Figure 1 - Pie Chart to show the use of AI LLMs to complete academic work)

Have you ever used ChatGPT, Snapchat My AI, Bing chat, Google Bard or other similar AI tools to help complete your school/collage/university work?

59 responses



While it's evident that students leverage these generative AI tools to aid their academic tasks, it's also noteworthy to highlight the usage of AI by educators to enrich their teaching methods. Teachers are harnessing the potential of generative AI in creating personalised lesson plans, generating engaging content, and automating mundane tasks to focus more on facilitating active learning within the classroom.

Generative AI with educators

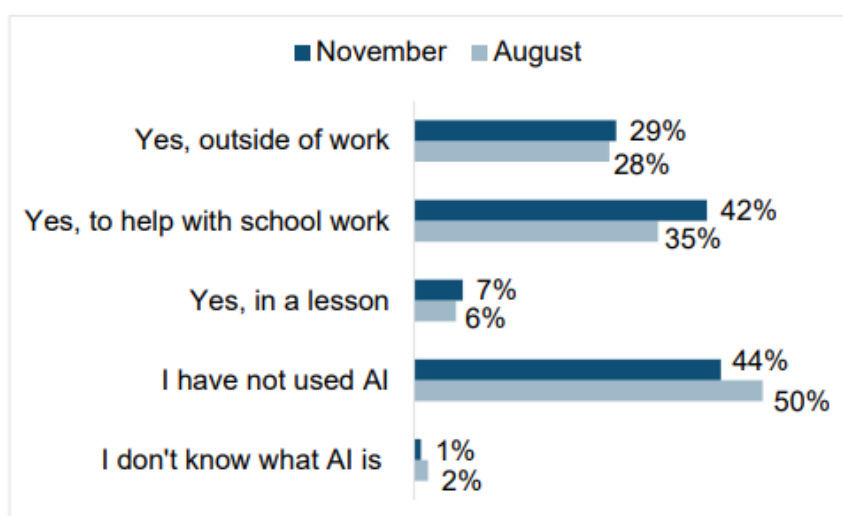
In an article published by Government's Department of Education, they say that generative AI can "reduce workload across the education sector", and "free up teachers' time, allowing them to focus on delivering excellent teaching" ([Generative artificial intelligence \(AI\) in education - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/articles/2024/01/generative-artificial-intelligence-ai-in-education) [20/01/2024]). This shows that generative AI can be used in education in a positive manner, and in the future AI could significantly help teacher's complete their workload faster in a shorter amount of time, and allow them to focus on better teaching, and this being recognised by the DfE gives validity to the use of AI in education. Teachers could use AI to make worksheets for their students, help explain a question with the LLM walking through the question, produce an example answer to a complex high mark question, and the possibility to even use LLMs and other AIs to mark students work, provide feedback and develop their work.

However, care must be taken to ensure these tools serve as a complement to, rather than a replacement for a teacher's judgement. It is crucial that the marking and feedback process is initially undertaken by the teacher. Following this, generative AI can be used to supplement the teacher's assessment, offering a second perspective that can point out nuances a human marker might overlook. This approach not only assists with the enhancement and development of student work but also supports the teacher by providing an additional resource.

In the realm of education, the utilisation of generative AI has been steadily increasing. A recent study conducted by the Department of Education reveals that nearly half of the teaching force, precisely 42%, have incorporated the use of generative AI to help them teach. ([Generative AI in education \(publishing.service.gov.uk\)](https://publishing.service.gov.uk/government/articles/2024/01/generative-ai-in-education) [27/01/2024])

(Figure 2 - Screenshot of Bar graph to show use of GenAI among school teachers)

Figure 1 Adoption of GenAI for education among school teachers

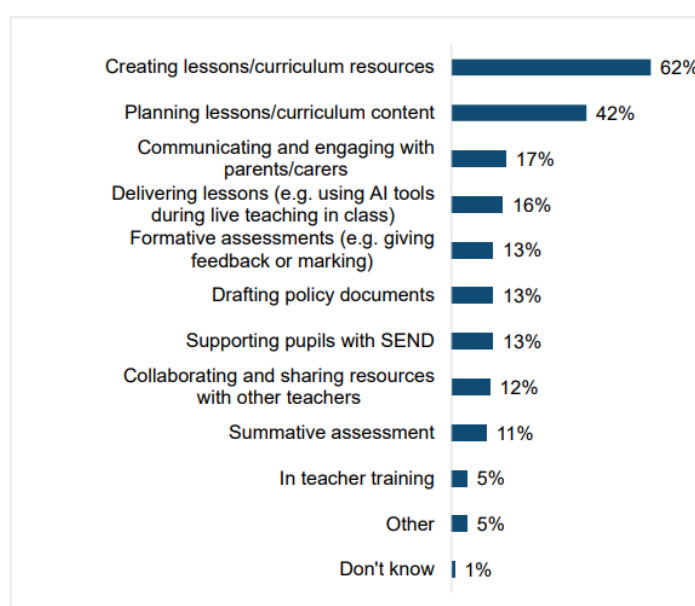


How are educators using AI for education?

In the same report by the DfE, teachers who said they used generative AI were asked on how they use it, a 62% majority of the teachers said they used it for “Creating lessons/curriculum resources”, 40% said for “Planning lessons/curriculum content”, 17% said “Communicating and engaging with parents/carers”, 16% said for “Delivering lessons (e.g. using AI tools during live teaching in class)”, 13% said for “Formative assessments (e.g. giving feedback or marking)”

(Figure 3 - The use of GenAI amongst the subset of teachers and leaders who use genAI)

Figure 4 GenAI applications amongst the subset of school teachers and leaders using it



Undeniably, there exists a spectrum of responsible and precarious applications of generative AI in the education sector. A rather unsettling example of utilising genAI, raised by educators, is its

deployment during live teaching classes. 16% of AI-using teachers have engaged in this practice. The crux of the contentious issue lies within the uncertain terms under which generative AI tools are employed during such lessons. If the educators lean too heavily on AI to address student queries and lack personal insight into the subject matter, we may find ourselves questioning their necessity in the teaching. Generative AI serves advantageously in aiding educators to decipher intricate inquiries and create model responses. Nonetheless, considering the amount of fallacies AI is susceptible to, such as 'hallucinating' - *a phenomenon in which large language models or AI-generated chatbots construe non-existent patterns in a humanly imperceptible manner, creating flawed or nonsensical outputs* - it remains a tool to be used sparingly ([Large Language Models pose risk to science with false answers, says Oxford study | University of Oxford](#) [20/01/2024]). Users must both tread cautiously around AI's declarations. While they may bring assistance, the teacher should be the primary knowledge resource and not these new dubious AI models that are regularly inaccurate. As echoed by the DfE: "Having access to generative AI is not a substitute for having knowledge in our long-term memory. To make the most of generative AI, we need to have the knowledge to draw on." and "[It] cannot replace the judgement and deep subject knowledge of a human expert." ([Generative artificial intelligence \(AI\) in education - GOV.UK \(www.gov.uk\)](#) [20/01/2024])

In article published by the Department of Education, it reports, it is evident that generative AI can succumb to being 'inaccurate', 'biased', and 'out of date or unreliable' ([Generative artificial intelligence \(AI\) in education - GOV.UK \(www.gov.uk\)](#) [20/01/2024]). This concern is by no means unfounded and has been highlighted on multiple occasions. More worryingly, when these AI models disseminate inaccurate or entirely false information with an air of conviction, their faulty affirmations tend to reinforce the misinformation, misleading some individuals into accepting wrong information generated by these LLMs as verifiable truths ([Large Language Models pose risk to science with false answers, says Oxford study | University of Oxford](#) [20/01/2024]).

The implementation of AI for 'Formative Assessments', for instance, providing feedback or grading, appears to warrant a degree of apprehension. Generative AI frequently demonstrates a lack of reliability, thereby making their usage in marking student coursework or examinations largely precarious. The primary cause of concern is these novel AI platforms' predilection towards errors and inaccuracies. This could lead to students receiving an unrepresentative grade, either grossly inflated, potentially leading to unwarranted complacency and decreased study motivation, or extremely low, which could detrimentally impact their self-esteem or elicit psychological distress in extreme cases.

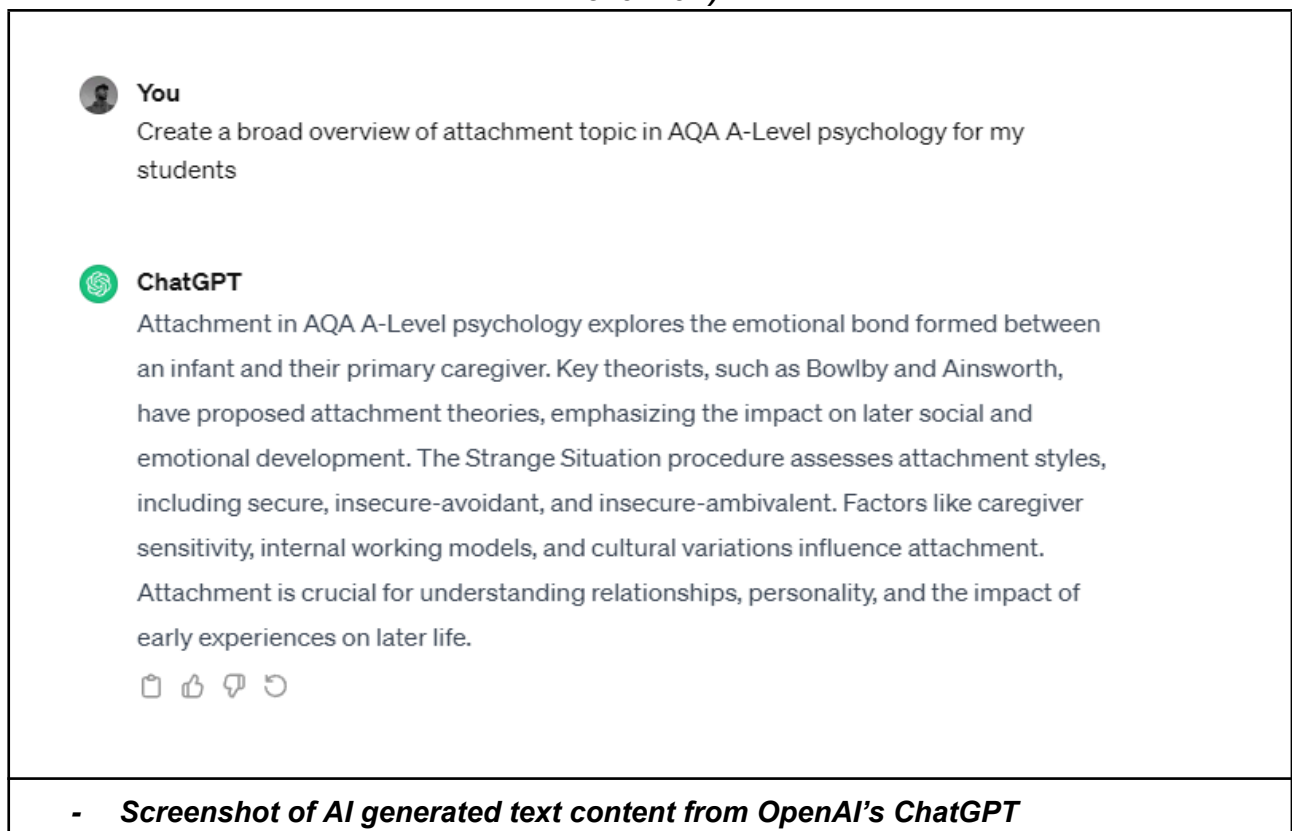
Similarly, the deployment of AI for 'Communicating and Engaging with Parents/Carers' situates itself in a complex dynamic. Educators spend a long time and significant strain on communicating with student's homes about students behaviour and education performance. Having to write statements about students' reports is time consuming, having 20 students per class and multiple classes it can take forever for teachers to complete this. By using generative AI like GPT, google bard or similar LLMs can make it much faster and easier. These AI tools might enable educators to focus more on the actual teaching and provision of student support. However, these systems are far from infallible; echoing the DfE 's warning, biases or statements 'taken out of context and without permission' could result in potential pitfalls. For example, the teacher might feed information about a student's misconduct into the AI input, which could subsequently portray that student as generally ill-behaved based on potentially unrelated low academic performance. Such an outcome would reflect a gross misjudgement of the student's character demonstrating the possible adverse impacts of AI deployment.

The illustration of generative AI utilised responsibly within the realm of education can be seen in areas such as “Curating educational materials” and “Designing lesson plans and curriculum content”. A considerable proportion of an educator's role and time centres around meticulous lesson planning and curriculum management, which encompasses creating resources for learners while elucidating class content.

A substantial proportion of educators (62%) reported utilising generative AI, primarily for the purpose of "Crafting instructional content/curriculum resources". The deployment of generative AI for creating educational resources can serve as an invaluable tool. Large Language Models (LLMs) like ChatGPT, Google Bard, along with other varieties of AI, have been extensively trained on copious amounts of data and house vast repositories of knowledge spanning a multitude of topics, gathered from books, websites, and articles ([Large Language Models pose risk to science with false answers, says Oxford study | University of Oxford](#) [20/01/2024])... This wealth of information equips these LLMs to generate highly insightful text, spanning a broad array of subject matters which could prove to be an invaluable resource for educators.

Since these LLMs have undergone training on extensive amounts of data, they possess knowledge and awareness of the contents included in the syllabus/specification, and know guidelines laid down by certification bodies such as AQA, Edexcel, OCR, and numerous others, both within the UK and internationally. Consequently, teachers can simply create lesson resources by prompting the AI with “Create a broad overview of attachment topics in AQA A-Level psychology for my students” which then can be used to create an opening to a new topic, a revision of a topic or printed into their students booklets. Here's the resulting generation from ChatGPT being given that prompt.

(Figure 4 - Screenshot of an exemplar prompt a teacher may use to create a content overview)



Another use case is to create a fill in the blank for a lesson starter or activity, for example a geography teacher may give Google Bard the prompt “Make a fill in the blank lesson activity for my students for GCSE geography on the topic of tectonics.”

(Figure 5 - Screenshot of an exemplar prompt a teacher may use to create an activity starter)



Make a fill in the blank lesson activity for my students for GCSE geography on the topic of tectonics.

View other drafts



GCSE Geography Tectonics Fill-in-the-Blank Lesson Activity

Title: Earth in Motion: A Tectonic Tour

Aim: To consolidate understanding of key tectonic concepts and processes through interactive fill-in-the-blank exercises.

Instructions:

1. **Warm-up:** Briefly discuss the theory of plate tectonics, highlighting the main types of plate boundaries and their associated features.
2. **Fill-in-the-Blank Activities:**

Section 1: Plate Boundaries

1. The Earth's surface is divided into large, rigid plates that move relative to each other due to _____ forces.
2. There are three main types of plate boundaries: _____, _____, and _____.
3. At _____ boundaries, plates move _____ each other, creating features like _____ and _____.
4. At _____ boundaries, plates move _____ away from each other, resulting in the formation of _____ and _____.
5. _____ boundaries mark where plates _____ past each other, often causing _____ and _____.

Section 2: Plate Tectonic Features

1. When plates diverge, the molten rock below rises to the surface and cools, forming _____ ridges.
2. _____ trenches are deep, V-shaped valleys formed at convergent boundaries where oceanic plates _____ beneath another plate.
3. The San Andreas Fault in California is an example of a _____ transform boundary, causing _____ and _____ earthquakes.
4. _____ mountains are formed when two continental plates _____ together, pushing landmasses upwards.
5. Volcanic activity is often concentrated at plate boundaries due to the presence of _____ plumes and _____ zones.

Section 3: Tectonic Effects on Landscapes

1. The _____ forces within the Earth can also cause _____ movements, forming features like _____ and _____.
2. _____ erosion along coastlines is influenced by the underlying _____ rock formations, which are shaped by tectonic processes.
3. _____ resources like oil and gas are often found within sedimentary basins formed at _____ boundaries.
4. Understanding plate tectonics helps us predict and prepare for _____ hazards like _____ and _____.
5. _____ studies, using techniques like _____ and _____, provide valuable data on plate movements and potential risks.

Bonus Round:

1. Can you name a specific example of each type of plate boundary and its associated features?
2. Explain how plate tectonics has contributed to the formation of the landscape in your local area.
3. Research a major earthquake or volcanic eruption related to plate tectonics and discuss its impact on the environment and people.

Debrief:

Discuss the completed fill-in-the-blank exercises, clarifying any misconceptions and reinforcing key learning points. Encourage students to ask questions and share their understanding of different tectonic concepts.

Extension Activities:

- Create a labeled diagram of a typical plate boundary, highlighting the key features and processes.
- Research a specific tectonic landform, such as the Himalayas or the Mid-Atlantic Ridge, and present your findings to the class.
- Debate the ethical implications of exploiting resources located in areas vulnerable to tectonic hazards.

Remember to adjust the difficulty and scope of the activity to suit your students' level and available time. You can also add visuals, games, or other interactive elements to make the learning experience more engaging.

I hope this helps create a fun and informative fill-in-the-blank lesson on tectonics for your GCSE geography students!



- **Screenshot of AI generated text content from Google's Bard (Now rebranded to Google Gemini)**

It's evident from this example just how transformative a tool like Google Bard can be for educators. The task of composing the prompt and receiving the generated output from Bard took barely two minutes. In the same timeframe, a teacher might only have managed to write a lesson title and objectives. Yet Bard was able to create a fitting title, articulate the activity objective, craft the activity itself, propose multiple bonus questions and even suggest related extension activities too.

What's more, Bard essentially furnished the teacher with a comprehensive lesson plan, by offering instructions to commence with a warm-up discussion on tectonics, devise several fill-in-the-blank exercises addressing the various facets of tectonics, such as plate boundaries and landscape features, and an impressive bonus round prompting students to conduct research into a significant tectonic event. Additionally, Bard provided a debrief for the teacher and further activities which would undeniably prove beneficial for both teachers and students, even going so far as to suggest ways to make the lesson more dynamic and engaging for the students.

Such a comprehensive lesson plan might have taken a teacher an entire day to create, but with the assistance of AI, this can be achieved within minutes. This exemplifies the profound impact that large language models (LLMs) can have on optimising a teacher's time, freeing them up to deliver lessons, provide student feedback, and offer extra support to those in need. It is therefore undeniable that AI will prove invaluable to a great many educators, schools and educational institutions that choose to harness its potential.

However, as mentioned earlier, the DfE says that generative AI can be "inaccurate", "inappropriate", and "out of date and unreliable" and this stands true for using AI to create lesson plans and lesson resources. For example, in the first use case of AI to produce an overview of

attachment in psychology, it used the American spelling of “emphasizing” rather than the British spelling of “emphasising”, this is a small mistake but it shows that AI can be inaccurate and using the direct generation of the AI for students resources could cause some students to use that inaccurate content in exams and be lead to learn the wrong topics. The reason for this spelling mistake is because these AI large language models have been prominently trained on American data, though the data they've been trained on is large, it's not representative of all varieties of data from the world and can cause these biases of favouring different spellings. This example applies to other issues, for example, we asked the ChatGPT to produce the overview for AQA A-Level psychology, however it's very likely that the generated text doesn't include topics from the AQA specification and even possible it includes content that isn't relevant. Same goes for the Google Bard example for the geography tectonics activity, it's very likely that Bard may have missed out important parts for the topic or included topics that aren't relevant for the topic of education level. Such mistakes that a trained teacher may have not made.

This highlights the critical need for teachers to maintain a comprehensive understanding of their subject area. We must ensure that teachers do not become overly dependent on such generative AI tools. They should be aware enough to spot potential errors made by AI and rectify them to prevent students from acquiring misleading information or developing gaps in their knowledge. Teachers need to grasp the complex knowledge of their subject matter, effectively explain it to their students, and provide valuable feedback and support.

A potential concern for the future could be teachers over-relying and excessively utilising these innovative Generative AI tools for teaching, thus risking their ability to explain complex themes, develop engaging and valuable lesson plans, discover effective learning activities, and overall, undermining their fundamental role as educators, merely acting as intermediaries who transmit the AI's knowledge to their learners. If AI begins to assume the role of the teacher, and the teacher becomes the messenger, the question of the necessity and relevance of teachers may arise, potentially endangering the future existence of the teaching profession. However, as we observe now, teachers continue to be an essential component of formal education; they hold a position that computers cannot usurp. They communicate complex knowledge to students in an understandable and applicable way, and the presence of a real person to encourage learning is a considerable factor in education; students will not educate themselves using their computers, they need a genuine nudge.

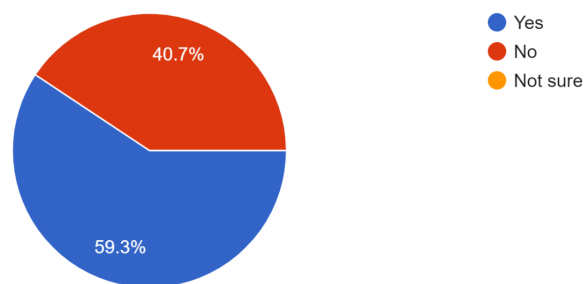
Generative AI with students

One of the biggest adopters of this new Generative AI boom is students in education. In the US, 30% of the traffic to ChatGPT is by students ([ChatGPT traffic spikes as students return to school | Mashable](#) [20/01/2024]), in the article with that statistics, they said “students are a strong user base for the AI chatbot”. As previously mentioned, in a research done for this distraction, 59.3% of the participants have said they have used some sort of generative AI LLM to help them complete their school/college/university work.

(Figure 6 - Pie chart representing number of students that have used some sort of LLM for their academic work)

Have you ever used ChatGPT, Snapchat My AI, Bing chat, Google Bard or other similar AI tools to help complete your school/collage/university work?

59 responses

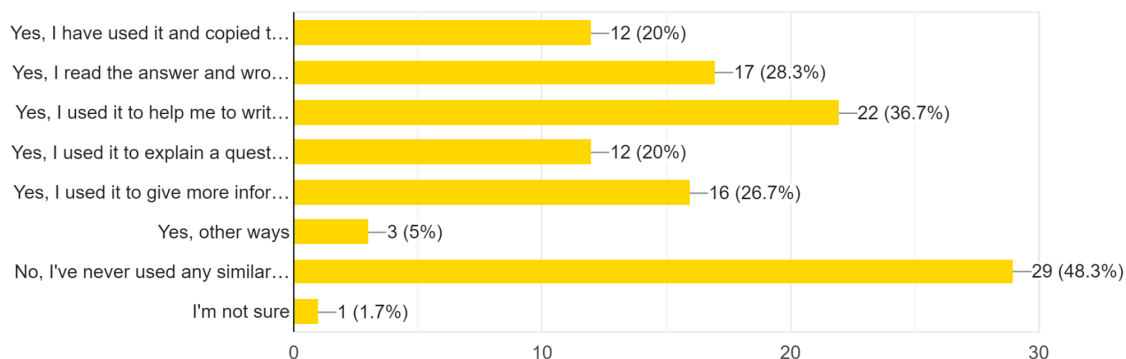


“Have you used ChatGPT, Snapchat My AI, Google bard, Bing or other similar services to help you with your school/college/university/academic work set by your teacher?”

(Figure 7 - Bar chart showing how students used LLMs for their academic work)

Have you used ChatGPT, Snapchat My AI, Google bard, Bing or other similar services to help you with you school/college/university/academic work ...y your teacher? (You can select multiple answers)

60 responses



Answer options in order shown in graph:

1. Yes, I have used it and copied the answer from it answer to do my work.
2. Yes, I read the answer and wrote it in my own words.
3. Yes, I used it to help me to write a framework and/or to guide me
4. Yes, I used it to explain a question
5. Yes, I used it to give more information about a topic/subject.
6. Yes, other ways
7. No, I've never used any similar AI tools to help me with my work
8. I'm not sure

A big concern among teachers, parents and students alike is that Generative AI will allow students to plagiarise their work and not actually do their own work. This is seen as a major problem as the point of school, college and university is to foster skills such as diligence, creativity, problem-solving, and independent thinking. The new rise of use in generative AI among students can make unhealthy dependence on these AI tools and services, thereby inhibiting their development of these pivotal skills that education aims to instil..

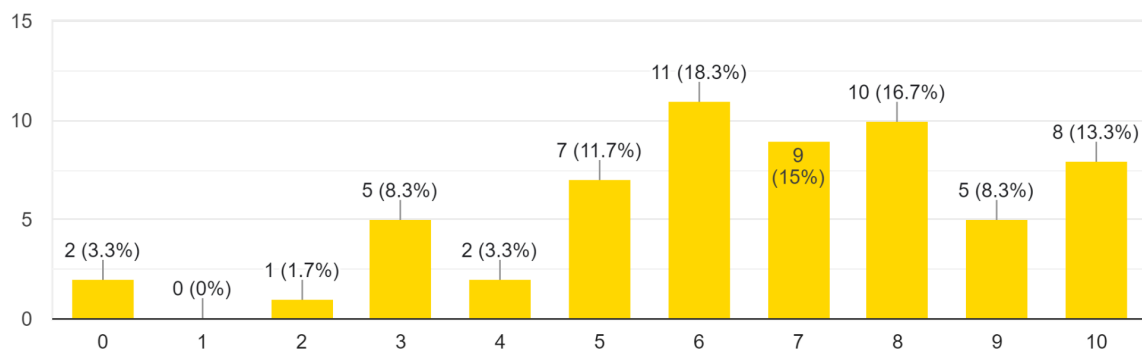
When asking participants in a students majority survey, how far do you agree with the following statement:

"The surge and use of AI tools like ChatGPT will make students lazy and not care about their work, they won't learn and won't know skills to apply to the real world (0 being fully disagree, 10 being fully agree)"

(Figure 8 - Bar chart showing how students believe AI will impact students effort and reliance on AI)

How far do you agree with the following statement: "The surge and use of AI tools like ChatGPT will make students lazy and not care about their work, t...rn and wont know skills to apply to the real world"

60 responses



A significant majority of participants expressed agreement to some extent (6-10) with the statement in question (71%). With an intense agreement (8-10) registered by 38%, and 13.3% completely endorsing the statement. This survey was predominantly answered by students, suggesting that a large segment of this demographic perceives AI as a potentially detrimental factor in their education. From this data, we can infer that many people anticipate that the rising adoption of AI tools like ChatGPT by students might incite a decline in their diligence towards their work and hinder the development of their skills due to over-reliance on AI. This trajectory poses a latent risk; not only could this scenario lead to poor performance in examinations, but it also raises concerns about students' capacity to cope with real-world challenges, such as professional endeavours, academic research, or university assignments where AI usage might be constrained.

This isn't just a theoretical idea, in my survey, figure 7 - *'Bar chart showing how students used LLMs for their academic work'* shows that 10% of the participants said "Yes, I have used it and copied the answer from it to do my work." when they were set to work by their teachers. This suggests that many students aren't taking an active part in actually doing their work and are rather simply copying and pasting answers, which won't stick in their head, help them to seek and find information, and stop them from developing their own points. Further, this thought is backed up by a student participant of my survey answering the question: *"Share your views and opinions on AI (artificial intelligence). Whether good or bad, or just an observation, thought, suggestion, or even talking about not knowing what AI is."*

with their response:

(Figure 9 - A student participant's response, a view on artificial intelligence)

"I think AI can be very helpful in some ways, like with a quick answer to something, however, it's stopping people from actually learning things themselves, like I fully use AI to write my essays so now I'm rubbish at writing essays and I can't actually think for myself when it comes to writing answers. So basically just means everyone's gonna become thick and then AI will actually take over the world cos all humans are dumb."

- Student Participant, Age 17

While this is a very informal and colloquial answer to a dissertation survey question, it stands as a testament to prove that this new development of generative AI, primarily LLMs, will cause students not to actually work to answer questions and prevent them from learning things themselves. As the students state, they have become reliant on the use of AI to write their essays and now lack the ability to think of their own answers and write their own essays. Proving suggestions that AI will make students lazier in work and hinder students academic developments.

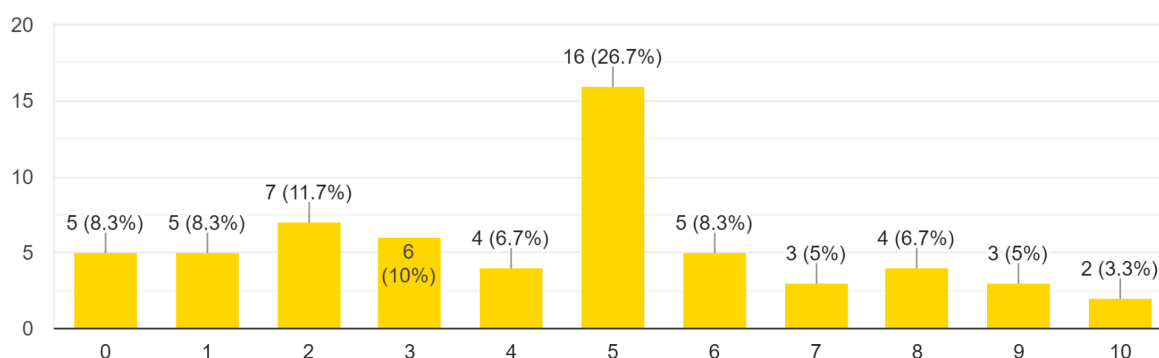
While the majority (71%) of participants in figure 8 - *'Bar chart showing how students believe AI will impact students effort and reliance on AI'* - express concerns about AI making students less engaged and lazy, figure 7 - *'Bar chart showing how students used LLMs for their academic work'* reveals that 20% of students admit to simply copying answers from an LLM for their school/college/university work. This suggests that students are well aware of the negative impact this approach may have on their education, yet they continue to resort to it. Despite understanding the potential drawbacks of relying on AI for academic tasks, students often succumb to the allure of the easiest path, a tendency deeply rooted in human nature. While this behaviour may provide short-term relief from the burden of assigned work and even alleviate pressure from teachers or parents, it reflects a mindset more prevalent in younger students, particularly those under 23/25, where ongoing brain development may influence decision-making processes.

Seeing as how AI is seen by students and used, it raises the question of should students be allowed to use these AI tools and services for educational work at all? When given the statement *"The use of ChatGPT, Google Bard, My AI and other similar services should be fully banned from education and should never be allowed or encouraged to be used in education"* participants responded as such:

(Figure 10 - Bar chart showing students agreement if AI should be fully banned in education)

How far do you agree with the following statement: "The use of ChatGPT, Google Bard, My AI and other similar services should be fully banned from ... be allowed or encouraged to be used in education"

60 responses



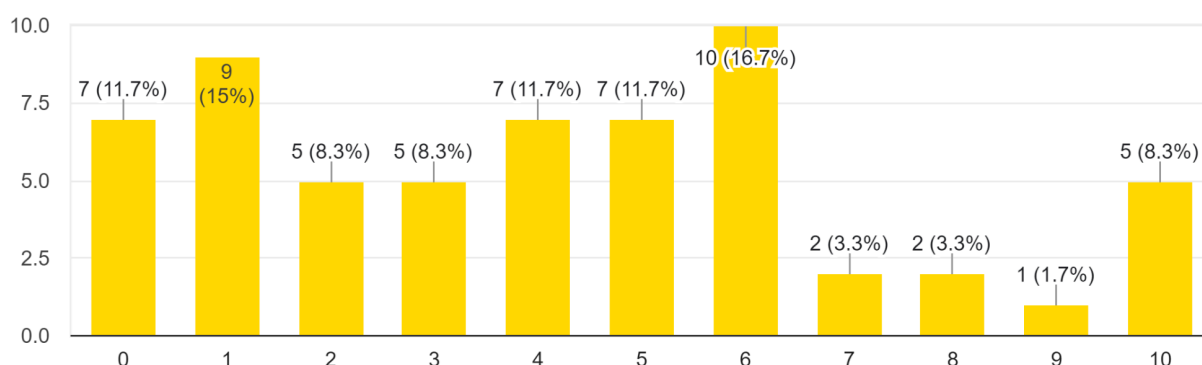
The principal response was '5', accounting for 26.7% of the participants, indicating an uncertainty or neutral stance towards the statement; the bulk of participants selected a number below 5 (27 out of 60, constituting 45%). This suggests that while there's no outright belief in the necessity to ban AI in education completely, there remains no compelling collective agreement either. This lack of consensus isn't unexpected since generative AI is still in its infancy and the full exploration of its potential positive or negative ramifications on society has yet to materialise.

However, when asked a similar question "Students should be allowed to use AI services like ChatGPT in their NEA, EPQ, dissertation, coursework and other non-exam graded work" participants responded in a more certain and stronger manner, as such:

(Figure 11 - Bar chart showing students agreement if AI should be allowed to use in non-exam graded work)

How far do you agree with the following statement: "Students should be allowed to use AI services like ChatGPT in their NEA, EPQ, dissertation, coursework and other non-exam graded work"

60 responses

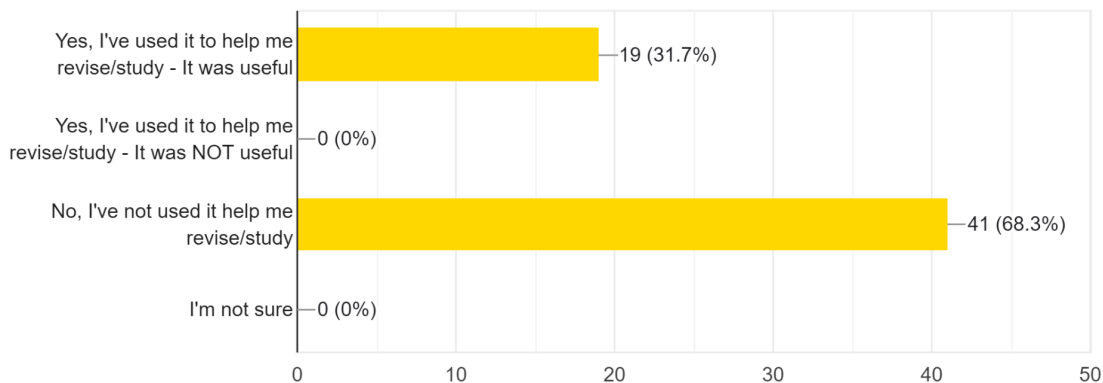


Interestingly, the majority of participants expressed opposition to the use of generative AI LLMs in non-exam graded work. This demonstrates an awareness among many of the importance of originality in graded work and the imperative to resist the temptation to misuse AI.

In the same survey, I asked “Have you used ChatGPT, Snapchat My AI, Google bard, Bing or other similar services to help you with your study or revision for an exam? (Real or mock exam). And was it useful?

(Figure 12 - Bar chart showing if students used AI to aid with revision, and if they found it useful)

Have you used ChatGPT, Snapchat My AI, Google bard, Bing or other similar services to help you with you study or revision for a exam? (Real or mock exam) And was it useful?
60 responses



While the majority of the participants said they hadn't used generative AI to help them study/revise before, 31.7% of the participants have said “Yes, I've used it to help me revise/study - It was useful” and not a single participant said that “Yes, I've used it to help me revise/study - It was NOT useful”. This shows that using AI like LLMs in study/revision is helpful and should be encouraged to be used, used in the correct way.

For learners and AI, despite potential misuse, AI cannot be dismissed outright in the educational context. Whilst a percentage of participants admitted to having simply copied and pasted answers, an encouragingly higher proportion responded affirmatively to using AI constructively: 28.3% said, “Yes, I read the answer and wrote it in my own words”, and 36.7% responded, “Yes, I used it to help me to write a framework and/or to guide me.”. This indicates that a significant number of students are utilising generative AI constructively, not merely reproducing answers verbatim from these LLMs, but articulating them in their own voice and using the concepts to form their own understanding. Likewise, they are leveraging LLMs to provide guidance and structure in formulating their own responses. Said use of AI in education is commendable and suggests that students who grasp how to use AI wisely for learning and self-improvement will likely outperform their peers who use AI as plagiarism and possibly do better than students who don't use AI at all in the future.

The future of education with generative AI

Teachers and the use of AI

GenAI is currently infiltrating education, specifically LLMs. People in many industries are using it, students are using it and so are their teachers. And because of the nature of generative AI LLMs of being filled with academic text and knowing such widespread topics, subjects and ideas, generative AI LLMs are such useful and capable tools for education and show their prominence. This rise in use of AI in education will likely continue as more students and teachers play around with it and realise its potential of helping to learn, free up time, make education easier and more personalised for students. Educators will find use for genAI and it's very likely that soon, the majority of teachers will be deploying the use of GenAI in some way in their workload, teaching or classroom. This is evident by the growing number of teachers who have said they used it in the survey conducted by DfE, and in my own student survey showing that students are using GenAI. The DfE seems to expect this rise of AI in education and that it being the biggest impacted sector as they say advances in AI are likely to have a profound and widespread effect on the UK economy and society, and that education is one of the top sectors expected to be impacted by AI and GenAI. ([Generative AI in education \(publishing.service.gov.uk\)](https://publishing.service.gov.uk/government/publications/generative-ai-in-education) [27/02/2024])

And while this new experimental bubble is growing and the department of education says in their own words that it's not always accurate and reliable, they seem to still be encouraging it and want GenAI to be used by teachers, but correctly. They see the potential benefits it could bring.

“GenAI’s potential to benefit education, such as by acting as a tool to support teachers with their workload and enable self-directed and personalised learning for students. ”

([Generative AI in education \(publishing.service.gov.uk\)](https://publishing.service.gov.uk/government/publications/generative-ai-in-education) [27/02/2024])

They understand that it's still developing and it has issues, but they recognise that it's going to stay and become more widely used in education. And they don't seem to be against it. There's an expectation of the DfE to be against it as there's a high risk to students plagiarising, not developing their skills, and teachers being over reliant on it as mentioned earlier in the dissertation and also it's only a very new technology. But DfE seems to expect more teachers to use GenAI in the future and see the benefits it could have.

In an article from the DfE , they say that they're working with people in education and experts to identify opportunities to improve education and reduce workload using generative AI. ([Generative artificial intelligence \(AI\) in education - GOV.UK](https://gov.uk/government/publications/generative-artificial-intelligence-ai-in-education) [28/02/2024]) This clearly shows that Gen AI is seen as a useful tool by the government, and that we can expect genAI to be used more widely in education in years to come. In this case, being used by teachers to make their workload easier. And the DfE encourages teachers to use these new technologies to “make the most of the opportunities that technology provides” and to “use technology safely and effectively to deliver excellent education that prepares pupils to contribute to society and the future workplace”.

With the blessing from the DfE, their research and survey in the use of GenAI, It's vibrant and written in the stars that GenAI will be more commonly used in education by schools, teachers and other educators. However the DfE seems to be more focused on the use of AI by teachers and not use by students. Students are proven to be using genAI already. So what's the future of AI among students?

Students and the use of AI

Sam Altman, the CEO of OpenAI, believes that AI will revolutionise education like calculators did, but it won't replace learning itself. He has said that all tools like ChatGPT will likely change the way homework is done, particularly take-home essays. However, he emphasises that AI should be used as a tool to enhance learning, not as a shortcut to avoid it. ([Sam Altman: Homework will 'never be the same' says ChatGPT founder Sam Altman - The Economic Times \(indiatimes.com\)](#) [10/02/2024])

"We have a new tool in education. Sort of like a calculator for words," he said. "And the way we teach people is going to have to change and the way we evaluate students is going to have to change." ([Sam Altman: Homework will 'never be the same' says ChatGPT founder Sam Altman - The Economic Times \(indiatimes.com\)](#) [10/02/2024])

Like Sam, many other professionals and observers in the AI field, believe that AI will simply be like calculators were to maths. They won't replace maths but be used as a tool to learn more and be faster. LLMs will simply help students learn faster and will be used as a tool to learn and won't replace education in any major way.

One way this is being done is by students using LLMs like ChatGPT to act as 'AI private tutor' for them ([New HEPI Policy Note finds more than half of students have used generative AI for help on assessments – but only 5% likely to be using AI to cheat](#) (25/02/2024)). Personal tutors for students can be costly, not every student can afford a personal tutor, and not every school can afford to hire a personal tutor for their students. But having a personal tutor can be very advantageous for students as it allows them to have a one to one education, compared to a traditional class of students and one teacher, the teacher can't focus all their attention on one student, while a tutor can. But as mentioned, tutors are expensive. However with the advent of Bard, ChatGPT, Bing Chat (*now copilot*) students can ask questions directly to these models and receive answers back that are quick, conversational and tailored for them. This conversational part is fantastic, if a student doesn't understand a question or content, they can simply ask the LLM, and if they still don't understand, they can simply ask the model to explain it in a more comprehensive manner for them. Like a tutor, AI models can give students example questions to answer and review and give feedback on the students answers.

However, to use LLMs effectively, you need to know what generated text you want. Students trying to learn a subject they're unfamiliar with can't be promised to do better in class or exams by using AI. An AI language model can't beat or become on par with real tutors. Students need to prompt the LLM to do so, they need to instruct the LLM to act as their teacher for their specified topic, and they need to ask questions and prompts correctly. These LLMs are useless without a good prompt, the user needs to give them a clear instruction and guide on what to output. This means that students might be getting taught the wrong stuff for their subjects or not learning the things they need to know due to lacking knowledge on how to prompt an LLM and what to ask for.

Conclusion

In conclusion, the use of generative AI in education presents both opportunities and challenges. The data and research presented in this dissertation indicate that generative AI, particularly in the form of large language models (LLMs), is being increasingly used by both students and educators in various capacities.

Amongst students, there is a noticeable trend of using generative AI as a tool for academic work, with a significant percentage admitting to copying answers directly from AI-generated content. This raises concerns about plagiarism, academic integrity, and the potential hindrance of students' learning and intellectual development. However, it is worth noting that a considerable number of students are using AI more constructively, such as reading generated answers and writing them in their own words or using AI to guide them in framing their own responses. This suggests that when used responsibly, generative AI can complement students' learning and aid them in understanding complex concepts.

Educators, on the other hand, are leveraging generative AI to enhance their teaching methods, create personalised lesson plans, and automate mundane tasks, thus allowing them to focus more on facilitating active learning within the classroom. The use of generative AI by teachers has been recognised by the DfE as a means to reduce workload and improve teaching quality.

However, caution must be exercised to ensure that generative AI serves as a complement to teachers' judgement and expertise, rather than a replacement. It is essential that the marking and feedback process is initially undertaken by the teacher, followed by AI supplementation to offer an additional perspective. The accuracy and reliability of generative AI in the educational context also remain areas of concern, as these models can exhibit biases, inaccuracies, and generate outdated or unreliable information. Therefore, teachers should maintain a comprehensive understanding of their subject area to rectify any potential errors made by AI and prevent students from acquiring misleading information.

While generative AI has the potential to revolutionise education and make learning more efficient and personalised, it is crucial to strike a balance between its usage and maintaining the development of crucial skills such as critical thinking, creativity, and independent problem-solving. The Department of Education recognises the potential benefits of generative AI in education but also acknowledges the need to use AI safely and effectively, with teachers retaining their role as the primary knowledge resources.

Looking towards the future, the widespread adoption of generative AI in education seems inevitable. The DfE expects an increase in the use of AI by teachers, and the potential benefits of AI in education, such as reducing workload and enabling personalised learning, are being recognized. However, the discussion around the use of AI by students remains contentious. While some believe that AI should be fully banned from education due to concerns about plagiarism and lack of skill development, others argue that AI can be used as a tool to enhance learning when used responsibly.

Ultimately, the future of AI in education will depend on finding the right balance between leveraging its potential benefits and mitigating its potential risks. Continued research, collaboration among stakeholders, and the development of guidelines and best practices will be essential in ensuring

that AI is used effectively, ethically, and in a manner that supports the overall educational goals of fostering critical thinking, creativity, and independent learning.

Evaluation

In evaluating my EPQ dissertation, I believe that it was a successful exploration of the topic of AI and education. The research and analysis I conducted allowed me to develop new skills and gain a deeper understanding of the subject.

One of the strengths of my dissertation was the use of primary and secondary sources. Conducting my own survey provided valuable insights into how students are using generative AI in their academic work. Additionally, analysing reports and papers from reputable sources such as the Department for Education enhanced the credibility of my research.

I also believe that my dissertation was well-structured, ordered, and presented. My abstract provided a clear overview of the topic and the aims of the research. The literature review effectively examined the reliability of secondary sources and provided a comprehensive analysis of existing research on AI in education. The discussion section delved into the implications and potential risks and benefits of AI in education, offering a balanced perspective on the topic.

However, there were some areas in which I could have improved. One of the challenges I faced was changing my dissertation topic midway through the process. This affected the amount of time I had to gather data and analyse it thoroughly. In retrospect, I would have benefited from more planning and organisation in the early stages of my research, which I had done to an extent, but I believe if I had bullet pointed discussions and topics to further focus on, the time I had for my dissertation would have been much wider, allowing me to possibly even better improve my EPQ.

Additionally, while I provided strong arguments and analysis in my dissertation, I could have delved deeper into specific topics and developed more comprehensive points. Expanding on the arguments and including more evidence could have strengthened my overall argument and provided a more nuanced understanding of the impact of AI in education.

Despite these areas for improvement, I am proud of the work I have done in my EPQ dissertation. It has allowed me to develop critical research and analytical skills, taught me how to correctly reference sources, analyse quantitative data, discuss qualitative data, create my own survey, and it has provided me with a deeper understanding of the topic of AI and its potential implications in education. Overall, I believe my dissertation was a valuable contribution to the field of AI and education and valuable to my skill development.

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