

**Using the Robot as a Research Assistant: Research Design Using  
Generative AI**

**White Paper**

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## Table of Contents

<b>1. Background .....</b>	<b>4</b>
<b>2. Literature Review .....</b>	<b>8</b>
2.1 Introduction .....	8
2.2 What can AI do in research? .....	10
2.3 Can ChatGPT help with scientific writing? .....	11
2.4 AI's potential in conducting literature reviews.....	13
2.5 Using AI as a writing tutor.....	14
2.6 ChatGPT's impacts on higher education.....	15
2.7 Integrity rules.....	16
<b>3. Case Study.....</b>	<b>18</b>
3.1 Case study: Introduction.....	18
3.2 Case study: Assignment 1 .....	19
3.3 Case study: Assignments 2 - 3.....	22
3.4 Case study: Assignment 4 - 6 .....	29
3.5 Case study: Assignment 7 - 9 .....	40
3.6 Findings .....	48
<b>4. Interview/survey .....</b>	<b>49</b>
<b>5. Identifying issues of adoption.....</b>	<b>53</b>
<b>6. Summarizing adoption recommendations .....</b>	<b>55</b>
<b>7. References.....</b>	<b>59</b>

## 1. Background

Master in Management and Systems (MASY) is a graduate program under the School of Professional Studies at New York University. Being a STEM (Science, Technology, Engineering, and Mathematics) program, MASY wishes to examine the features of AI systems like ChatGPT to see how they can execute and automate day-to-day office operation tasks within a specific technical role.

The client of this project is a professor in the MASY program instructing several research-related courses. The client was initiating the Gen (for generative) AI Study Group in the program, which investigates using AI assistants to alleviate humans' repetitive and mechanical tasks in different areas, such as marketing, analytics, project management, and research.

One of the client's courses, Research Process Methodology, prepares students for their upcoming graduation capstone project and other future projects. In this course, students are guided to conduct a research proposal, and its workload requires students to spend a lot of time on assignments. The client seeks to introduce AI assistants to students, one of the most popular chatbots, to see if it can reduce student workload. With the help of AI assistants like ChatGPT, the client expects his

students to gain new skills in the proposal writing process and increase their working efficiency.

I first researched all areas related to the theories and applications of AI in different industries to understand the state-of-the-art. According to the McKinsey Technology Trends Outlook report published in 2022, from aerospace and defense to telecommunications, AI showed a high relevance to most industries. Also, generative AI recorded the highest innovation score of all 14 technology trends in 2021.

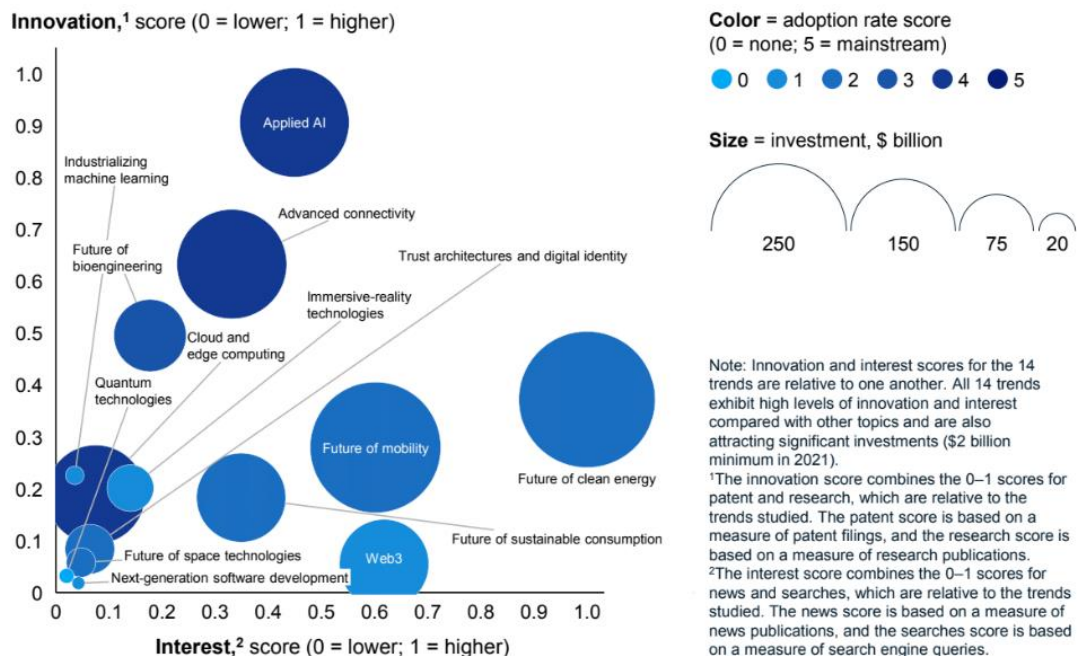


Figure 1.1 AI recorded the highest innovation score. (Chui, 2022)

Then, I explored the potential of the chosen tool, ChatGPT. We may only ask ChatGPT to perform simple tasks such as finding articles, correcting grammatical

errors, and debugging codes. However, this tool has already been applied in business scenarios. Another McKinsey report (Chui, 2022) gave examples of possible ChatGPT use cases across the business:

Marketing and sales	Operations	IT/engineering	Risk and legal	HR	Utility/employee optimization
<b>Write marketing and sales copy including text, images, and videos</b> (eg, to create social media content or technical sales content)	<b>Create or improve customer support chatbots</b> to resolve questions about products, including generating relevant cross-sell leads	<b>Write code and documentation</b> to accelerate and scale developments (eg, convert simple JavaScript expressions into Python)	<b>Draft and review legal documents,</b> including contracts and patent applications	<b>Assist in creating interview questions for candidate assessment</b> (eg, targeted to function, company philosophy, and industry)	<b>Optimize communication of employees</b> (eg, automate email responses and text translation or change tone or wording of text)
<b>Create product user guides</b> of industry-dependent offerings (eg, medicines or consumer products)	<b>Identify production errors, anomalies, and defects</b> from images to provide rationale for issues	<b>Automatically generate or auto-complete data tables</b> while providing contextual information	<b>Summarize and highlight changes</b> in large bodies of regulatory documents	<b>Provide self-serve HR functions</b> (eg, automate first-line interactions such as employee onboarding or automate Q&A or strategic advice on employment conditions, law, regulations, etc)	<b>Create business presentations</b> based on text prompts, including visualizations from text

Figure 1.2 Examples of possible ChatGPT use cases. (Chui, 2022)

In the end, I narrowed my research direction to ChatGPT in scientific writing. Although feasible, few articles have shown satisfactory performances of ChatGPT generating scientific research text at this stage. Most sources illustrated that ChatGPT could only be used in performing early tasks under human researchers' supervision. In most cases, ChatGPT was recommended to handle rough sourcing and text summarization.

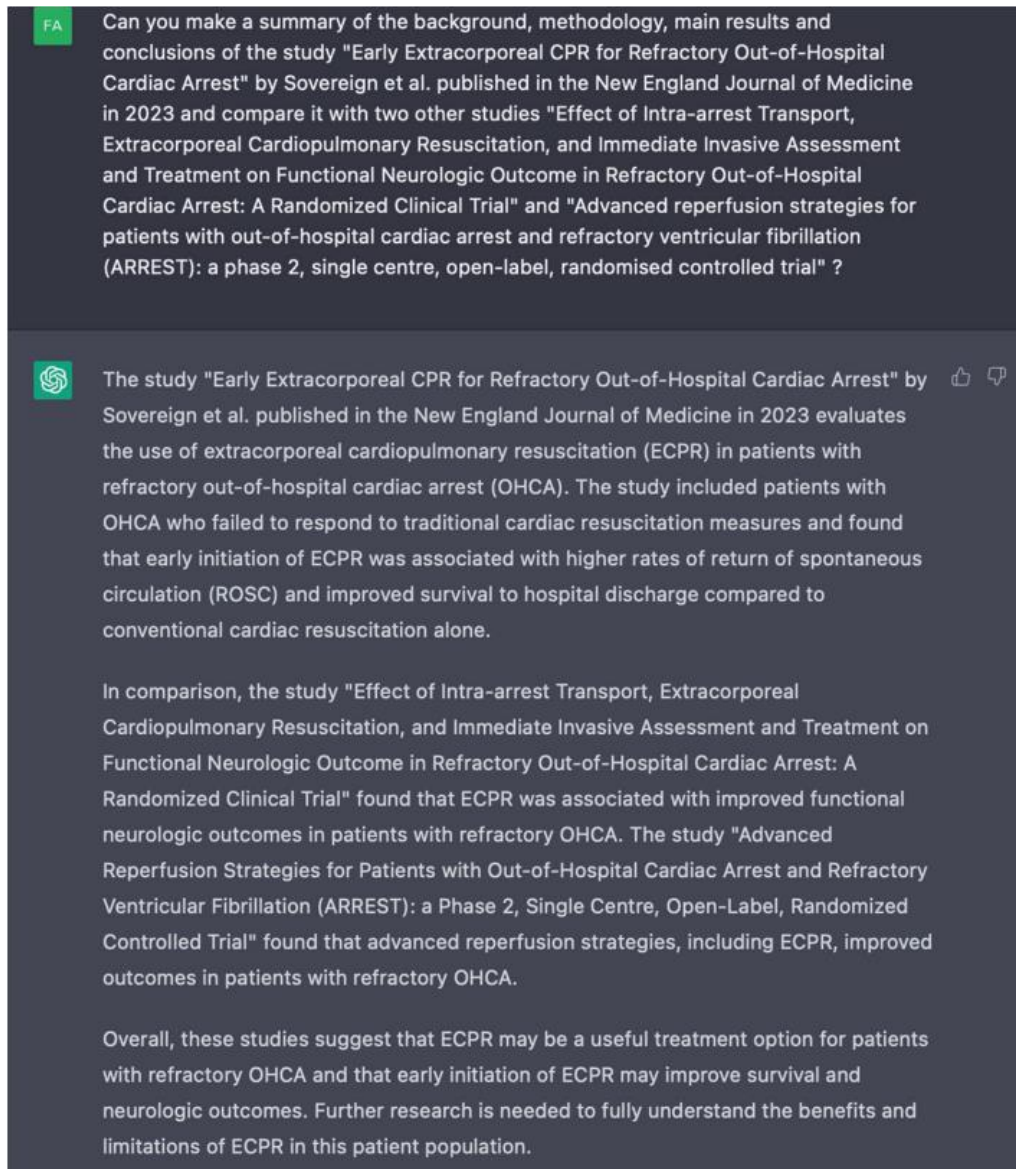


Figure 1.3 Example of a summary of the existing literature on a specific topic. (Salvagno, 2023)

The research process lasted throughout the whole project. Further detail and contents are shown in the literature review. Also, the client supported me by continuously providing weekly updates on related topics.

## **2. Literature Review**

### **2.1 Introduction**

As technology advances, people have developed many AI tools to help humans complete tasks in different disciplines. Through further adjustment and improvement, some tools can independently complete specific tasks and replace human participation. When jobs are too complex for AI tools, they can alleviate repetitive and mechanical work to improve efficiency. Then, humans can tackle more significant and creative tasks. Nowadays, AI tools have participated in almost all our daily activities.

For researchers, there are too many other things to do besides performing the experiment or working on the project, such as learning background information, finding resources, writing the paper, and attending meetings. Besides consuming plenty of their time, these tasks also create many difficulties for researchers. They need to master various skills from different areas, including networking, using search engines, writing clearly and accurately, and so on, to support their research.

Students at New York University (NYU) School of Professional Studies (SPS) are taking the research process & methodology (RPM) class to learn and practice their skills in writing research proposals to prepare themselves for their capstone projects and other projects in their futures. Students were required to do everything

independently for years, from brainstorming ideas and searching articles to designing experiments and writing proposals. Thus, this course was usually considered fully loaded with time-consuming work. Although the experiences and skills students gain from this course are meaningful, students often complain that they suffer from this course's workload. As a research assistant, using a chatbot in this class will help solve this situation. While practicing the same skills, students can use a chatbot to help them with tasks in their assignments, including resource searching, project design, proposal writing, and language correction.

Despite the convenience brought by AI tools, writing proposals with the help of a chatbot can be dangerous. When students write with the chatbot, there is a risk for them of violating the academic integrity rules. The differences between plagiarizing, citing, and just sourcing for ideas become ambiguous and thus complicated for students to handle. The use of chatbots should be carefully considered to ensure students are credited for their work. In other words, the chatbot should be used as an assistant to help students alleviate their work, but not a tool to plagiarize.

This literature review was created to examine the possibility and effectiveness of involving a chatbot as a research assistant to help researchers develop their research proposals. Moreover, the findings from this literature review will be used as the foundation for this project to deliver a white paper giving suggestions to the MS in



Management and Systems (MASYS) Program to adopt the advancing technology in its curriculum.

## **2.2 What can AI do in research?**

Innovation and developments in generative artificial intelligence (AI) technology are massive (Lin, 2023). According to Adams (2013), remarkable progress was already in the machine-assisted production of systematic reviews. As systematic reviews often have high requirements for details, it usually takes researchers a tremendous amount of time and effort to develop an excellent systematic review that accurately reflects the trends and changes in data. However, machines have already supported and simplified the process of reaching a systematic review. The author emphasized the importance of differentiating between tasks machines can complete and those that can't. Then, with machines alleviating humans' workload, researchers could improve the efficiency of the process.

Adams listed four steps during the process and explained the status quo of machines' involvement in each step:

1. Data Selection: In this process, text data mining techniques have advanced enough to handle most of the work under human direction.
2. Data Extraction: Although data mining techniques can select relevant data for researchers in most cases, researchers still have to perform a detailed reading of the

trail reports and metadata checking on their own. In the future, these tasks may be automated.

3. Data Assimilation: Tasks in this process have been semi-automated to various degrees for a long time. Complete automation of this process could be possible. Still, AI tools' involvement varies wildly from researcher to researcher.

4. Writeup: In this step, AI can help reviewers with their language, such as automatic text writing or translation. However, reviewers must still refine the machine-written text to fit their expectations. This process is considered a further bottleneck in creating a systematic review.

After a review is completed, machines could also help by presenting different contents to audiences with different needs, furthering the study's reach, and maintaining communication between commenters and authors.

### **2.3 Can ChatGPT help with scientific writing?**

ChatGPT is a trained Natural Language Processing model that interacts with its user in a dialogue format. It was developed by OpenAI, an AI research and development company based in the USA. (Lin, 2023)

In his paper, Salvagno (2023) discussed using ChatGPT in scientific writing.

ChatGPT is a chatbot developed by OpenAI. With the Generative Pre-trained

Transformer (GPT) language model, ChatGPT can understand and respond to natural

language inputs. Because of its popularity and ease of use, ChatGPT is a readily available and helpful tool for researchers in three tasks: draft generation, article summarizing, and language translation.

The author emphasized ChatGPT's remarkable ability to compose texts. Once the manuscript has been finalized, ChatGPT can format and edit the language, rewrite a particularly complex sentence, and even summarize text into an abstract. The result may not be entirely satisfactory, but it can be a first draft for humans to work on.

Throughout the content, Salvagno mentioned that AI could only organize, develop ideas and create an initial draft for researchers, but not generate new ideas. In other words, a human-based development of the text is still needed. While writing with AI, researchers should provide initial ideas and relevant resources for AI to create a draft and then further work on AI's draft to ensure the existence of knowledge, creativity, and critical thinking of human experts. AI should not replace researchers' "expertise, judgment, personality, and in the end, responsibility" (Salvagno, 2023).

Several ethical concerns with the use of chatGPT are also addressed. First of all, AI, such as ChatGPT, can be programmed to avoid directly copying existing work by reorganizing and rephrasing the text to reduce the percentage of plagiarism. This is considered a violation of academic integrity. Corresponding academic regulations are needed to regulate the use of AI in scientific writing. The unfairness to low-budgeted

researchers, if ChatGPT requires paying in the future, is also an existing concern opposing the use of ChatGPT in scientific writing.

## **2.4 AI's potential in conducting literature reviews**

Among all AI-aided writing tasks, AI excels at writing literature reviews since they are built on large volumes of documents. Wagner (2021) argued that AI has great potential to substitute humans on tasks such as identifying and retrieving relevant studies, analyzing large amounts of data, and suggesting new research directions. The paper breaks down the process of conducting a literature review into six stages: problem formulation, literature search, screening for inclusion, quality assessment, data extraction, and data analysis and interpretation. For each step, the AI-based tools can be used, the current state of AI development, and the future potential for AI support are discussed.

Among the review process steps, AI is evaluated to have:

1. High potential in search, rough screening for inclusion, objective and quantitative data extraction, and descriptive data analysis.
2. Moderate potential in problem formulation, verifying research gaps, detailed screening for inclusion, qualitative and scoping data extraction, theory development, and testing.
3. Low potential in quality assessment.

A trend can be found here by listing these tasks in the order of AI's potential. In the current state, the more objective and repetitive a task is, the more significant the potential AI has in this task. The trend fits the authors' point that "AI is at its beginning to transform traditional research practices." (Wagner, 2022). The more subjective, directive, and decisional a task is, the more humans should participate.

The paper also highlighted some challenges and limitations of AI, such as the risks of bias and the need for high-quality data. In conclusion, although AI has great potential to improve the efficiency and effectiveness of conducting literature reviews, at the current stage, AI should only be used to support, not replace, human researchers.

## **2.5 Using AI as a writing tutor**

It is frequently the case that students demonstrate their learning outcomes through writing papers. However, students may be unable to demonstrate their grasp of the material as expected due to many obstacles, such as inexperience in writing and writing in a non-native language. Nowadays, more and more students are using AI to perform a grammar check on their papers before submission. Yet, studies show that AI can do more than this.

Pereira (2019) noted that other than grammatical errors, text and image plagiarism and lack of synthesis are the most common errors in students' papers. After

submission, these error-filled papers are published in university-backed open repositories and wait to be cited in other papers.

In her report, Pereira designed a chatbot to help detect basic quality errors. For grammatical errors, a module called LanguageTool was implemented. A similarity algorithm was implemented in the chatbot to handle improper text transfers. To detect poorly referenced images, the chatbot used in this article first extracts them from papers and then sends them to Google Cloud Vision to verify their originality. This chatbot was considered to be able to provide a comprehensive check to papers before submission.

## **2.6 ChatGPT's impacts on higher education**

Iskender interviewed ChatGPT in 2023. (Iskender, 2023) ChatGPT was given questions in this interview to share its views on its potential impacts on higher education and academic publishing.

When asked about its potential applications in education, ChatGPT listed several tasks, such as customizing textbooks, grading assignments, and generating exam problems. ChaGPT did not mention its ability in writing assistance until it was asked. ChatGPT provided four ways to identify if an essay or text is generated by AI: look for unusual or repetitive language, factual errors, plagiarism, and lack of originality. (Iskender, 2023) While he mentioned ethical concerns several times during

the interview, ChatGPT failed to suggest any detailed rules or regulations that students should follow. This finding warns of the lack of policy in AI-related works.

## **2.7 Integrity rules**

Currently, no standardized rules exist regarding the use of AI in academic writing. Schools have different policies on using AI. Lukpat (2023) reported in the Wall Street Journal that New York City public school disallowed its system's access to ChatGPT. Southern Australian Universities allow students to use AI tools as long as it is disclosed. University of Pennsylvania's Wharton School went further and required students to use ChatGPT. (Moniz, 2023) Being a major technology trend (Chui, 2022), Chatbots like ChatGPT came too fast. Universities need more time to craft policies and regulations guiding students in using AI in their studies.

At NYU, AI-related policies have yet to be established. Moniz (2023) reported that NYU gave out three potential strategies to faculties to prevent students' inappropriate usage of AI tools in their work: look for AI use in completed classwork, create assignments that are difficult to complete with AI, or allow the use of AI for coursework with restrictions. Some professors at NYU included using ChatGPT or other AI tools as plagiarism in their syllabi. (Xiang, 2023) At the same time, AI-content tools were already front and center in the curricula in the MS in Professional Writing and

MS in Translation and Interpreting programs at NYU School of Professional Studies.

(NYU, 2023)



## 3. Case Study

### 3.1 Case study: Introduction

In the client's RPM course, students write research proposals on exploring the potential of applying Google VR glasses to SPS classrooms. Following the guidelines in the class materials, students work in groups weekly to produce each proposal section. The existing proposals from previous students are perfect samples to compare with ChatGPT's outputs on the same topic.

### Case A: Smart Google VR Glasses

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**Google** – Smart VR glasses allow workers to have access to information in 3D, in real-time



#### The Case

- You work for a NYU SPS
- The dean wants to know how Google VR glasses can help students
  - Select an application that helps students study, attend classes, learn, do their homework better
  - Does this advance in VR produce any benefit?
  - Should the school consider adding this capability to their curriculum to compete?



Figure 3.1 Google VR Glasses Case in the client's RPM course slides.

### **3.2 Case study: Assignment 1**

According to the client's RPM course materials, nine group assignments were in the research proposal writing process. The case study in this project followed this arrangement so that the client could easily apply ChatGPT in his course materials. For each assignment, the assignment requirements, students' responses, ChatGPT's prompt, ChatGPT's response, and the observation of comparing the two results were provided. In the case study, the major criteria used in comparing students' and ChatGPT's work were level of detail and accuracy.

#### **Assignment 1. Information/data needed to conduct the research**

##### **Assignment requirement:**

List the information or data needed to determine if applying Google VR glasses to college courses benefits students or not.

##### **Student's response:**

*"To find out if the implementation of 3D metaverse classrooms works well as proposed, there is a need to study whether this application does help with students' learning quality, career planning, and the SPS's overall popularity. In other words, it is necessary to define and analyze the KPI performances: in-class experience, job searching from metaverse class, SPS's registration rate for every term that provides metaverse classroom, and SPS's metaverse taught classes' registration rate.*

- *In-class experience:*

1. *Students' average final grades.*

*Grades are the most objective indicator of students' learning experience.*

2. *Student satisfaction survey of the course.*

*Being the majority of clients, students' feedback/ratings through student satisfaction surveys are essential.*

- *Job searching:*

1. *The employment rate in a year after graduation.*

2. *The average salary for students' first job.*

*Both students' employment rate and average salary positively correlate to how much they benefit from classes.*

- *Metaverse taught class registration rate:*

1. *The number of SPS applicants every year.*

*As students see the benefit of this technology application, more applicants should be attracted by SPS, thus bringing the school more revenue.*

2. *The retention rate of students who have taken metaverse-taught classes in the past.*


*Filtering out students' novelty effect of the new technology application is necessary to study the actual benefit of it.*

*If these KPIs' improvements are found through this study, it can be concluded that the application of this technology is booming.”*

**ChatGPT's query and response:**

In this assignment, the query entered into ChatGPT was identical to the directions given to the students.

**S** List the information or data needed to determine if applying Google VR glasses to college courses benefit students or not

 To determine if applying Google VR glasses to college courses would benefit students, the following information or data would be needed:

1. The specific courses or subjects in which the VR glasses would be used.
2. The goals or learning outcomes of the courses, and how the VR glasses could support or enhance these goals.
3. The target student population, including their prior knowledge and experience with VR technology, as well as any potential learning barriers or challenges they may face.
4. The VR hardware and software requirements, as well as any associated costs and maintenance needs.
5. The specific VR content or experiences that would be used in the courses, and how they relate to the course content and learning outcomes.
6. Evidence-based research on the effectiveness of VR technology for learning and the specific VR content or experiences that would be used.
7. Feedback from faculty and students who have already used VR technology in education, including their perceptions of the benefits and challenges.
8. Assessment strategies and tools to measure the impact of VR technology on student learning outcomes, engagement, and satisfaction.
9. Institutional policies and regulations related to the use of VR technology in education, including ethical considerations such as data privacy and security.
10. Resources and support needed for faculty and staff to effectively integrate VR technology into their teaching practices.

Figure 9.2 ChatGPT's response.

**Observation:**

In this assignment, ChatGPT returned a similar output to students' work, clearly listing different information and data needed to determine Google VR glasses' benefits. While students' responses focused narrowly on students' performances, ChatGPT's response was more general.

**3.3 Case study: Assignments 2 - 3****Assignment 2. Potential research questions****Assignment requirement:**

Frame potential research questions to study if applying Google VR classes to college courses benefits students.

**Students' response:**

*“1. : What is Zoom?*

*2: What is the Oculus Quest?*

*3: How can we measure students' satisfaction?*

*4: What kind of interaction takes place between students and the program?*

*5: What features should the metaverse in the Oculus include in order to maximize the user experience?*

*6: How will students use these features to understand the course content better?*

*7: What are the disadvantages of taking an online Zoom course compared to an in-person class?*

*8: Who would prefer to enroll in online Zoom classes in the first place? And why?*

*9: Do students perform better regarding tangible vs. intangible factors (grades vs. self-efficacy)?*


*10: What are the differences between the Oculus Metaverse and in-person classes?*


*11: Do different courses affect the outcome of students' learning experience in the metaverse with Oculus Quest?*

*12: What factors can we not simulate with existing technology to gain as close an experience as an in-person class?"*

### ChatGPT's query and response:

In this assignment, the query entered into ChatGPT was identical to the directions given to the students.

 S Frame potential research questions to study if applying Google VR glasses to college courses benefit students.

 Here are some potential research questions to study if applying Google VR glasses to college courses benefit students:

1. How does using Google VR glasses in college courses affect student engagement and motivation compared to traditional teaching methods?
2. What are the academic outcomes of students who use Google VR glasses in college courses compared to those who do not use them?
3. How does the use of Google VR glasses in college courses affect student retention and graduation rates?
4. What is the impact of using Google VR glasses on the development of critical thinking and problem-solving skills among college students?
5. How does the use of Google VR glasses in college courses affect the learning experience for students with different learning styles and abilities?
6. What is the effect of using Google VR glasses on the quality of communication and interaction between instructors and students in college courses?
7. How do the cost and accessibility of Google VR glasses affect their adoption and use in college courses?
8. What are the ethical and privacy concerns associated with the use of Google VR glasses in college courses, and how can they be addressed?
9. What are the best practices for incorporating Google VR glasses into college courses, and how can instructors effectively train and support students in their use?
10. How does the use of Google VR glasses in college courses compare to other emerging technologies, such as augmented reality or gamification, in terms of their impact on student learning outcomes and experiences?

Figure 3.3 ChatGPT's response

**Observation:**

Some of the research questions generated by students were similar to the ones generated by ChatGPT. Unlike students, ChatGPT did not focus on the definition of specific terms such as "Zoom" or "Oculus Quest (One of Google VR glasses' product names)."

**Assignment 3. Annotated references in APA style****Assignment requirement:**

Search for annotated references related to whether applying Google VR glasses to college courses benefit students. List them in APA style. Also, include the abstract, reason for selecting, and reference quality for each reference.

**Students' response (Example):**

*"V Alamäki, A., Dirin, A., Suomala, J., & Rhee, C. (2021). Students' experiences of 2D and 360° videos with or without a low-cost VR headset: An Experimental Study in Higher Education. Journal of Information Technology Education: Research, 20, 309–329. <https://doi.org/10.28945/4816>*



*Abstract: The prior research on low-cost VR technology is scant. Schools and universities need more budget to purchase tens or hundreds of expensive inbuilt VR headsets. Therefore, we recommend an alternative, low-cost solution. Methodology: We experimented with students' (N=100) responses to videos and VR technologies used in a higher education setting. We also applied a quantitative research approach examined in light of media richness and affective experience theories.*

*Reason for selecting: This case study examines students' affective responses to and relationships with two-dimensional (2D) and 360° videos that were experienced with or without low-cost virtual reality (VR) headsets. It is a good reference for determining if the Oculus Quest headset can bring better learning experiences for NYU SPS students.*

*Reference Quality: A. Due to the fact that our research on using the VR headset Oculus Quest can improve students' satisfaction, project researchers need to conduct testing or experiments on students. In this case, this article will be a perfect resource for researchers to design and build hypothesis tests. Peer-reviewed."*

**ChatGPT's query and response (Example):**

In this assignment, the query entered into ChatGPT was identical to the directions given to the students.

S

Search for annotated references related to if applying Google VR glasses to college courses benefit students. List them in APA style. Also, include the abstract, reason for selecting and reference quality for each reference.



1. Kim, S., Park, J. Y., & Lee, H. (2018). The effects of using virtual reality on students' academic achievements and motivation in science education. *Journal of Educational Technology & Society*, 21(3), 58-71.

Abstract: This study investigated the effects of virtual reality (VR) on students' academic achievements and motivation in science education. Participants were 150 seventh-grade students from two middle schools in South Korea. The experimental group (n=75) used VR to learn science concepts, while the control group (n=75) used traditional methods. The results showed that the experimental group had significantly higher academic achievements and motivation than the control group. These findings suggest that VR technology can be a useful tool for enhancing students' learning experiences in science education.

Reason for selecting: This study is relevant because it examines the effects of using VR technology in education, specifically in science education. It provides insight into how VR technology can enhance students' academic achievements and motivation.

Reference quality: This study was published in a peer-reviewed journal and provides a detailed methodology for the study. The sample size is also adequate for a study of this nature.

APA citation: Kim, S., Park, J. Y., & Lee, H. (2018). The effects of using virtual reality on students' academic achievements and motivation in science education. *Journal of Educational Technology & Society*, 21(3), 58-71.

Figure 3.4 ChatGPT's response.

**Observation:**

There appeared to be no difference between the responses generated by students and ChatGPT. However, ChatGPT provided fake sources. The client first

proposed a way to solve this issue by adding "Make sure they are existing articles" into the query, but later I found that ChatGPT did not work in this way with any prompt modification. The reason is that ChatGPT is based on a Large Language Model and does not have the ability to match relevant sources to any given topic. In this case, ChatGPT could not be expected to provide references that researchers can immediately use. Instead, it should be considered as a research assistant giving some great starting places. I used the names of those fictional articles, dropped them into Google Scholar, and found many related articles.

**The effect of Augmented Reality Technology on middle school students' achievements and attitudes towards science education**

D Sahin, [RM Yilmaz](#) - *Computers & Education*, 2020 - Elsevier

... In addition, it was found that **academic achievements** and attitudes of the **students** in the ... positively affected the **learning** environment by increasing **motivation**, class commitment and the ...

☆ Save [Cite](#) Cited by 248 [Related articles](#) [All 3 versions](#)

**The effect of the use of augmented reality applications on the academic success and motivation of 7th grade students.**

[E Kirikkaya](#), MS Basgöl - *Journal of Baltic Science Education*, 2019 - ERIC

... **using augmented reality** applications in **science teaching** ... improvement of **students'** achievement and **motivation**. Since ... the **results** cannot be generalized to the entire **science** ...

☆ Save [Cite](#) Cited by 25 [Related articles](#) [All 3 versions](#) [»»](#)

**Effect of the use of augmented reality applications on academic achievement of student in science education: meta analysis review**

J Kalemkuş, F Kalemkuş - *Interactive Learning Environments*, 2022 - Taylor & Francis

... the **effect** of the **use** of **augmented reality** applications on the **academic achievement** of **students** in **science education** in this ... to improve **academic performance & student motivation**. The ...

☆ Save [Cite](#) Cited by 7 [Related articles](#)

**Effects of an immersive virtual reality-based classroom on students' learning performance in science lessons**

[R Liu](#), [L Wang](#), J Lei, Q Wang... - ... *Journal of Educational ...*, 2020 - Wiley Online Library

... It can also contribute to **academic achievement**, **motivation** and problem-solving ... **virtual reality science** content We developed four **IVR science learning** units for sixth-grade **students**, ...

☆ Save [Cite](#) Cited by 87 [Related articles](#) [All 6 versions](#)

Figure 3.5 Related articles from Google Scholar.

### **3.4 Case study: Assignment 4 - 6**

#### **Assignment 4. A short literature review**

##### **Assignment requirement:**

Write a literature review on studying whether applying Google VR glasses to courses at New York University benefits students. The response should include an introduction, industry background, problem, proposed solution, technology, use cases, and conclusion, with two sentences in each part.

##### **Students' response:**

*“Introduction: Due to the fact that NYU SPS has provided numerous online courses during the Covid-19 Pandemic which encourages students who are far away from the NYU campus to enroll in such courses (Serhan, 2019). In this case, it is necessary for NYU SPS to improve online classes' learning experiences for its students. Online courses are one of the main features of New York University (NYU) SPS which attracts plenty of students from around the world who want to experience the study environment at NYU and learn industrial-oriented skills.*

*Industry: The industry that this project applies to is higher education; entailing undergraduate and graduate programs at universities across the US. The industry will take into account the courses learned within these programs, and how students work within these boundaries at an educational institution (Zhang, 2020).*

*Problem: A couple of noticeable drawbacks of taking online classes compared to in-person classes include lacking student-instructor interaction, harder for instructors to receive instant feedback from students, and harder for students to engage during online classes. Even though students can interact with instructors in Zoom classes by "raising hands" and "unmuting" their microphones, many instructors are still not able to capture students' feedback timely due to small notifications on instructors' screens (Novotny, 2022).*

*Proposed Solution: If NYU SPS can introduce a 3-dimensional classroom with metaverse by using the Oculus Quest headset which can mimic students attending class in person in its online program students (V Alamäki, 2021). Students may experience a more realistic NYU studying life which will lead to higher engagement and better performance throughout the whole program.*

*Technology: The standard Oculus Quest system consists of a VR headset (head-mounted display) and 2 controllers to be held in hands. You can use it to play games, work, study, and engage in numerous life-imitating and imaginative simulations.*

*"There are an estimated 58.9 million VR users in the US, and many of them use VR for different purposes like gaming, education, and work-related simulation." (Program, 2022)*

*Used Cases: In V Alamäki 's article (2021), researchers used 360-degree video VR headsets to compare with 2D videos in a higher education scenario. They found that*

*360° videos created a more positive effect than did 2D videos. Also, the technology provided a positive effect of enhancing the social sharing intention. The technology used in this article is similar to the Oculus Quest system used in our project.*

*In Zhang's study (2020), authors applied a VR virtual education platform to improve the learning quality and ability of college students. The research showed that the application of VR technology provides a new possibility to make up for students' low learning quality and efficiency when facing long duration learning. The purpose of this study is closely related to our ours' which is to improve students' learning experiences.*

*Conclusion: According to previous parts we stated, we believe that the metaverse oculus is suitable for NYU SPS to improve its online learning experience. "Noda is an application for building 3D concept maps and diagrams. Students can use this application to build sophisticated concept maps with shapes, text, images, and interconnecting lines." (Aumell, 2022)"*

**ChatGPT's query and response:**

In this assignment, the query entered into ChatGPT was identical to the directions given to the students.

S

Give a literature review on studying if applying Google VR glasses to courses in New York University benefit students. The response should include introduction, industry background, problem, proposed solution, technology, used cases and conclusion with two sentences in each part.



Introduction:

The integration of virtual reality (VR) technology into higher education has gained increased attention in recent years. This literature review aims to explore the potential benefits of applying Google VR glasses to courses in New York University (NYU) and the impact on student learning outcomes.

Industry background:

The higher education industry has witnessed significant changes in recent years due to advancements in technology. Virtual reality technology has the potential to revolutionize the education sector by providing immersive and interactive learning experiences for students.

Problem:

The traditional approach to teaching and learning in higher education has been criticized for being passive and ineffective. Students may struggle to stay engaged and motivated in traditional classroom settings, leading to poor learning outcomes.

Proposed solution:

The integration of Google VR glasses in courses offered by NYU can potentially enhance student engagement and motivation, leading to improved learning outcomes. VR technology allows for immersive and interactive learning experiences that can better facilitate student learning.

Technology:

Google VR glasses are a type of virtual reality technology that provides a 360-degree view of the virtual environment, creating an immersive and interactive experience for users. This technology can be used in various fields such as science, engineering, and architecture, to enhance the learning experience for students.

Figure 3.6 ChatGPT's response.



**Use cases:**

Several studies have explored the potential benefits of using VR technology in higher education. For example, a study by Kim, Park, and Lee (2018) found that using VR technology in science education can improve student academic achievements and motivation. Another study by Lee, Park, and Song (2020) found that using VR technology in a high school science course can increase student motivation.

**Conclusion:**


The integration of Google VR glasses in courses offered by NYU has the potential to revolutionize the education sector by providing immersive and interactive learning experiences for students. The use of VR technology can enhance student engagement and motivation, leading to improved learning outcomes. Further research is needed to explore the potential benefits of VR technology in higher education.

Figure 3.7 ChatGPT's response.

**Observation:**

Due to the spread of COVID-19, students formed a connection among COVID-19, online classes, and Google VR glasses. On the other hand, ChatGPT did not have this connection set up. This observation discovered the lack of human reasoning skills in ChatGPT's algorithm. After giving ChatGPT an updated query, its response contained similar content to students' work.

**S** Give a literature review on studying if applying Google VR glasses to courses in New York University benefit students under the COVID-19 condition. The response should include introduction, industry background, problem, proposed solution being applying Google VR glasses to NYU courses, technology, used cases and conclusion with two sentences in each part.



**Introduction:**  
The COVID-19 pandemic has disrupted traditional teaching and learning methods, forcing educational institutions like New York University (NYU) to adapt to remote learning. Virtual Reality (VR) technology, such as Google VR glasses, has emerged as a potential tool to enhance remote learning. This literature review aims to examine existing studies on whether applying Google VR glasses to NYU courses benefits students under the COVID-19 condition.

**Industry background:**  
The COVID-19 pandemic has accelerated the adoption of innovative technologies, such as VR, to support remote learning. NYU is among the institutions exploring the use of VR technology in higher education. VR technology offers a unique opportunity to enhance student engagement and create an immersive learning experience in a virtual environment.

Figure 3.8 ChatGPT's response.

Also, in this assignment, there were many grammatical errors in the students' responses. This showed that ChatGPT did a better job than students in avoiding writing grammatical errors.

### **Assignment 5. Experiment hypothesis**

**Assignment requirement:**

Write a hypothesis according to the research question: If NYU SPS introduces 3-dimensional classrooms with metaverse by using the Oculus Quest headset, which mimics students attending class in person in its online program, will students experience a more realistic NYU studying life which will lead to higher engagement and better performance throughout the program.

The hypothesis should include: h0 and h1 hypotheses, the theory of how to solve the problem, population, intervention, and control.

**Students' response:**

*H0: No significant difference in grades between the time before introducing Meta Oculus and after the incorporation of Meta Oculus.*

*H1: By using Meta Oculus, students will be able to obtain a better understanding of the course material, which will lead to higher class participation and significantly higher class average grades."*

*Theory: By using Meta Oculus lens, we can improve the student learning process/experience by heightening class interaction and overall student engagement. Ultimately, obtain better grades by the end of the academic year.*

*Population: Student body at School of Professional Studies at New York University.*

*Intervention: Attending class virtually via Zoom, using the Google Oculus lens.*

*Control: Class material including syllabus, content, professor, in-class activities and course load.*

**ChatGPT's query and response:**

In this assignment, the query entered to ChatGPT was similar to the directions given to the students. The only modifications were that the query for ChatGPT provided detailed descriptions to each part to match students' understanding of each part taught in class.

S

Write hypothesis according to the research Question: If NYU SPS can introduce a 3-dimensional classroom with Metaverse by using the Oculus Quest headset which can mimic students attending class in person in its online program, then students can experience a more realistic NYU studying life which will lead to higher engagement and better performance throughout the whole program.

The hypothesis should include:  $H_0$  and  $H_1$  hypothesis, the theory of how to solve the problem,

Population: (what is the unit of analysis?)

Intervention: (what is the change you will be introducing to see the effect on the input variables on the outcome?)

Control: (what is the current condition that will not change that you will be measuring change against?)



$H_0$  hypothesis: There will be no significant difference in engagement and performance between students using the traditional 2-dimensional online classroom and students using the 3-dimensional Metaverse classroom with the Oculus Quest headset.

$H_1$  hypothesis: Students using the 3-dimensional Metaverse classroom with the Oculus Quest headset will experience higher levels of engagement and performance compared to those using the traditional 2-dimensional online classroom.

Theory: The introduction of a 3-dimensional classroom with Metaverse by using the Oculus Quest headset will enhance the students' experience of attending class online by providing a more realistic and immersive environment. This will lead to a greater sense of presence, social presence, and interactivity, which will increase students' engagement and motivation, resulting in better academic performance.

Population: The unit of analysis for this research is the students enrolled in NYU SPS's online programs.

Intervention: The intervention is the introduction of a 3-dimensional Metaverse classroom with the Oculus Quest headset to the online program.

Control: The current condition that will not change and will be used to measure the change is the traditional 2-dimensional online classroom used in NYU SPS's online programs.

Figure 3.9 ChatGPT's response.

**Observation:**

Given the same research question, ChatGPT was able to generate outputs similar to students' responses in terms of content and topic. In this assignment, the control section from ChatGPT's response is not very specific. Further human editing is needed based on ChatGPT's response to add more details. Also, students made a mistake in determining the population. According to the research question, the population should be those students attending online programs, but not all students at NYU. This was a great example of using ChatGPT to avoid content errors caused by humans while writing.

**Assignment 6. Final hypothesis**

This case study skipped assignment 6 since it was a refined version of assignment 5 with more details. When writing proposals with ChatGPT, this task should be completed by human researchers.

### **3.5 Case study: Assignment 7 - 9**

#### **Assignment 7. Dependent and independent variables**

##### **Assignment requirement:**

Provide independent and dependent variables with quantitative and qualitative details for the research.

##### **Students' response:**

*"Independent variables:*

- *Class via Zoom for one semester, for a class of 20*
- *Class via Meta Oculus Pro (provided by the school) for one semester, for a class of 20*

*Dependent variables:*

- *Students assignments & exam grades*
  - *By retrieving data from professors, and comparing class average scores*
- *Students engagement*
  - *By evaluating the frequency of conversation between the student to their classmates, by counting amount of question marks from conversation log captured during class time*
  - *Duration of conversation as well as with instructors*

- *Analyzing key words related to class material*
- *Students evaluation to the course*
  - *Gathered from end of semester class survey*
  - *Average rating score*
  - *Keyword extraction for short answers”*

**ChatGPT’s query and response:**

In this assignment, other than the assignment requirement, the specific research question was added into ChatGPT’s query, since it was not supposed to know the previous work.



S

provide independent and dependent variables with quantitative and qualitative details for the research: If NYU SPS can introduce a 3-dimensional classroom with Metaverse by using the Oculus Quest headset which can mimic students attending class in person in its online program, then students can experience a more realistic NYU studying life which will lead to higher engagement and better performance throughout the whole program.



Independent variable:

The independent variable in this research is the introduction of a 3-dimensional classroom with Metaverse by using the Oculus Quest headset to the online program. This intervention is a qualitative variable as it involves a change in the mode of delivery of the online course.

Dependent variables:

1. Engagement: Engagement is a qualitative variable in this research. It can be measured using self-reported surveys, which include open-ended questions and Likert scale questions to assess the level of involvement, interest, and motivation of students in their online coursework.
2. Performance: Performance is a quantitative variable in this research. It can be measured objectively using the following indicators:
  - a. Grades: The grades achieved by the students in their coursework can be measured quantitatively to assess their performance.
  - b. Completion rates: The completion rates of students in the online course can also be measured quantitatively.
  - c. Test scores: The scores obtained by the students in the tests and quizzes conducted throughout the online course can also be measured quantitatively.

Figure 3.10 ChatGPT's response.

**Observation:**

Although both responses mentioned engagement and performance in this assignment, students' responses covered a wider variety and more detailed variables

than ChatGPT's output. This finding showed that ChatGPT becomes less potent when tasks are customized with more domain-specific needs. At this stage, human researchers need to engage in meeting those requirements.

### **Assignment 8. Qualitative and quantitative data collection**

#### **Assignment requirement:**

Give quantitative and qualitative data collection methods to the data you specified in the previous work. Identify testing methods for each data.

#### **Students' response:**

- *“Students' assignments & exam grades*
  - *By retrieving data from professors, and comparing class average scores*

*Test: T-test for comparing students' assignments & exam grades*

- *Students engagement*
  - *By evaluating the frequency of conversation between the student to their classmates, by counting the amount of question marks from the conversation log captured during class time*
  - *Duration of conversation as well as with instructors*
  - *Analyzing keywords related to class material*

*Test: T-test for students' engagement frequency and duration.*

*Test: Sentiment analysis(topic extraction) for keywords and contents.*

- *Students evaluation to the course*
  - *Gathered from end of semester class survey*
  - *Average rating score*
  - *Keyword extraction for short answers*

*Test: T-test for rating score.*

*Test: sentiment analysis for short answers.”*

**ChatGPT's query and response:**

In this assignment, other than the assignment requirement, previously specified data was added to ChatGPT's query since it was not supposed to know the previous work.

**S** Give quantitative and qualitative data collection method to these data: students' grades, student's class engagement and students' evaluation to courses. Also, identify testing method for each data.



Quantitative data collection methods for:

1. Students' grades:

Quantitative data collection methods for students' grades can include:

- **Academic records:** Collecting students' grades from academic records, which are maintained by the university, is a common way of collecting quantitative data.
- **Gradebooks:** Instructors can maintain a gradebook that includes each student's grades for the assignments, exams, and other assessments. This data can then be used for analysis.
- **Online platforms:** Many learning management systems provide instructors with an online gradebook that can be used to collect and analyze quantitative data on students' grades.

**Testing method:** Statistical analysis can be used to test the relationship between different factors and students' grades. For example, a regression analysis can be used to examine the relationship between attendance and grades.

Figure 3.11 ChatGPT's response.

## 2. Student's class engagement:

Quantitative data collection methods for student's class engagement can include:

- Observation: Instructors can observe the level of engagement of students in the classroom and take notes. The frequency and quality of the students' contributions can be used to analyze engagement.
- Online platforms: If the course is delivered online, engagement can be measured by tracking the students' use of the platform, such as the frequency of logins and time spent on the platform.

Testing method: The statistical analysis can be used to test the relationship between different factors and students' engagement, such as the impact of class size on engagement. For example, a t-test can be used to compare the engagement levels of students in small and large classes.

Qualitative data collection methods for:

### 1. Students' evaluation of courses:

Qualitative data collection methods for students' evaluation of courses can include:

- Open-ended surveys: Surveys can be conducted with open-ended questions to capture students' opinions and feedback on the course, such as what they liked and disliked about the course.
- Focus groups: Focus groups can be organized with a small group of students to discuss their experiences, opinions, and suggestions for improving the course.
- Interviews: Individual interviews can be conducted with students to gather detailed and nuanced feedback on their experiences in the course.

Testing method: Qualitative data can be analyzed using thematic analysis to identify common themes and patterns in the students' feedback. For example, the analysis can identify the most commonly mentioned strengths and weaknesses of the course.

Figure 3.12 ChatGPT's response.

**Observation:**

ChatGPT provided the same testing methods as the student's work in this assignment. I noticed several different data collection methods between the two responses. These were caused by students' considerations of each method's cost and ease of implementation. Although students' methods were more pragmatic than those of ChatGPT, some methods identified by ChatGPT complemented students' responses.

**Assignment 9. Qualitative data analysis**

Assignment 9 was skipped in this case study since students already used text-mining tools to complete this assignment.

### 3.6 Findings

For time-consuming tasks involving high repetition, such as rough resource screening, there is no doubt that ChatGPT can manage them.

Supported by the vast database and a robust algorithm, ChatGPT has a broader view in answering questions than humans. Also, unlike humans, ChatGPT's "thoughts" are not limited by unstated criteria that are usually built into humans' minds, such as budget and ease of implementation. Therefore, ChatGPT can always be used as a tool during the draft-making and options-offering process.

However, for the same reason, as tasks get more complicated, ChatGPT becomes weaker. Researchers can play with "prompt engineering" to feed ChatGPT with more detailed queries, but humans can never code all their considerations into a robot. Thus, the final decision-making process should never be completed by ChatGPT.

Also, the fake resources provided by ChatGPT should warn all researchers about the reliability of information from the internet. With these findings, I suggest a collaboration between humans and ChatGPT in a "human-ChatGPT-human" scheme. Human researchers should initiate tasks. Then, the tasks can be partially passed to ChatGPT. Finally, human researchers modify ChatGPT's output and reach the final deliverable.

## **4. Interview/survey**

A survey was designed to gather students' responses on their research proposal writing experiences and their opinions on working with ChatGPT. The survey was constructed as follows:



## Research Proposal Writing with ChatGPT

This anonymous survey is for my capstone project on research proposal writing with generative AI.

sw5095@nyu.edu [Switch account](#)

Not shared

In average, how long did your group spend on each week's group assignment?

- Under 1 hour
- Between 1-2 hours
- Between 2-3 hours
- More than 3 hours

How did your group construct each group assignment?

- By hand only
- Partially by AI (such as ChatGPT)
- By AI only

How often do you write with chat bots?

- Never
- Sometimes
- Always

Figure 4.1 Survey on research proposal writing. (1)

If you do write with chat bots, how do you use them?

- Resource finding
- Summarizing articles
- Text generating
- Grammar Checking
- Other: \_\_\_\_\_

What is your opinion on academic writing with chat bots?

Your answer \_\_\_\_\_

What do you think chat bots can help you with writing?

Your answer \_\_\_\_\_

[Submit](#) [Clear form](#)

Figure 4.2 Survey on research proposal writing. (2)

This survey was designed for those students who have worked on the Google VR glasses topic in the client's RPM course. Other than gaining insights into students' opinions on academic writing with chatbots, the main objective of this survey was to collect the time students spent on each week's group assignments. I planned to compare this data with the time used by writing a research proposal with the help of ChatGPT in the case study. If writing a proposal on the same topic with ChatGPT consumes significantly less time than writing by students alone, I could conclude that

writing with ChatGPT can significantly reduce students' workload and save them more time on assignments.

However, after discussing with the client, I noticed that I emphasized reducing students' workload too much while conducting the survey. The proposed application of this project, the client's RPM course, aims to practice students' skill sets to construct research proposals. Focusing too much on alleviating students' workload does not benefit students in gaining proposal writing skills. Other than this, the potential inaccuracy of survey responses may lower the survey's utility. We decided not to post this survey after consideration.

## 5. Identifying issues of adoption

Several issues and concerns with generative AI are identified along with the project.

Firstly, the reliability of information from the internet is always questionable. The links and the data gathered from generative AI can be wrong. According to Gmail creator Paul Buchheit, AI chatbots such as OpenAI's ChatGPT could make typical search engines obsolete within two years. As students rely more on generative AI in their daily tasks, they may relax their vigilance on the answers retrieved from generative AI. Either inaccurate or wrong information may jeopardize students' work.

As discussed previously, the courses designed in the MASY programs aim to prepare students for their future work. Proper preparation always requires a deep understanding of theories, along with enough practice. Relying on generative AI too much may reduce the courses' values in deepening students' understanding in each step of writing research proposals and enhancing students' proficiency in research-related skills such as critical thinking.

Students are expected to create their work and not plagiarize from existing works. However, generative AI can quickly paraphrase existing text with slight chance of being noticed by existing AI-writing detection methods. Therefore, the concern of

students' work with generative AI violating the academic integrity rules could be a severe problem. Other than performing well in research, generative AI can also contribute to answering questions, including exam questions. Unless the exams are held closed-book, the dishonesty issue hidden behind the ease of copy-paste process is also worth considering. Related school policies need to be conducted.

Information security concerns have caused many troubles nowadays. More academic usage of AI tools is expected with the MASY program's adoption. The importance of information security needs to be emphasized during the adoption.

Finally, as technology advances, AI systems' resource cost and opacity will keep increasing. The MASY program must stay proactive to keep track of the advancing technology trends.

## 6. Summarizing adoption recommendations

The adoption recommendation will be discussed in this section.

### 1. **Communicate goals.**

Before adopting generative AI in its curriculum, the MASY program should communicate this plan to the whole program. It is necessary to align students' and instructors' personal goals with the program's goal to succeed in this adoption.

### 2. **Start small and scale up gradually.**

The Minimum Viable Product (MVP) approach is recommended here. This approach focuses on iteratively generating reachable value, gathering feedback, and making minor changes to ensure the desired outcome while allowing the program to test its idea without facing unnecessary risks. The program should start with courses most relevant to generative AI, such as text data mining, and then introduce this technology with feedback and adjustments to other courses. This method provides the program with a smooth adoption process with enough time to train instructors and students.

### 3. **Let AI support, but not replace humans.**

Although ChatGPT demonstrated great potential in creating a research proposal in this project, the case study showed that researchers still need to apply modifications based on ChatGPT's work. The MASY program should consider using AI

to supplement students' skill sets but not a substitution for the currently required skills. AI tools should not replace the skills students learn and practice in the current curriculum. Instead, courses should introduce AI tools to students based on original knowledge and skills.

Students should be guided with the use of AI tools. Take ChatGPT as an example. When asked what rules humans should follow to receive accurate answers, ChatGPT returned the following response:



what rules should query makers using a chatbot like your follow to make sure they answers they receive are the most accurate and factual as possible



To help ensure that the answers received from a chatbot like me are as accurate and factual as possible, users can follow some general rules when submitting queries:

1. Be specific: Provide as much detail as possible in your query, including any relevant context or background information. This can help the chatbot to better understand your question and generate a more accurate response.
2. Use clear and concise language: Avoid using vague or ambiguous language, as this can make it harder for the chatbot to understand the intent of your query. Use clear and concise language that is specific to the topic you are querying.
3. Verify the accuracy of the response: If the response provided by the chatbot is important or has potential consequences, it's a good idea to verify the accuracy of the response using additional sources. While chatbots can be very helpful for answering simple or routine questions, they may not always be able to provide accurate or complete information for more complex or nuanced queries.
4. Provide feedback: If the chatbot provides an inaccurate or incomplete response, provide feedback to the developer or service provider. This can help to improve the accuracy and effectiveness of the chatbot over time.
5. Use credible sources: When querying about factual information, try to use credible sources of information. Look for sources that are reliable, trustworthy, and have a reputation for accuracy, such as academic journals, government agencies, or reputable news outlets.

By following these rules, users can help to ensure that the answers they receive from a chatbot like me are as accurate and factual as possible. However, it's important to remember that chatbots are still an evolving technology, and may not always be able to provide perfect accuracy or completeness for every query.

Figure 6.1 ChatGPT's response.

For each AI tool, the course instructor that introduces the tool should apply detailed guidelines to students to help them use the AI tool properly.

**4. Plan for issues of adoption.**



The issues and concerns have been identified in the previous section.

Information technology-related courses should include generative AI in their course contents and emphasize information security concerns to give students comprehensive insights. Also, instructors should carefully handle the application of generative AI in their courses to increase students' working efficiency while not compromising learning goals. For example, I recommend that students keep composing their personal assignments by themselves for the clients' RPM course and then work on their group research proposals with ChatGPT.

Related school policies should be crafted along with the adoption.

5. **Set up an effective AI adoption governance structure.**

The MASY program should set an effective governance structure to direct the adoption process, source AI-related technology, and react to the feedback posted by instructors and students. This setup allows the program to make adjustments without delays and reduces resistance to adoption.

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