

Title:

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- **Module: ACCA5033**
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- **Assignment 1**
- **Course: HN/BSc Computing (Innovation & Research)**

Mid Map :

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Question 1 : Explanation of the Mind Map

My mind map focuses on different AI-based learning tools and how they support students in various ways. I chose this topic because AI is becoming an important part of education, and many students now rely on it when studying independently. This clearly links to innovation, as technology is changing how people learn and develop skills [1].

One key area in my mind map is homework and study support tools such as **Socratic**, **Studyable**, and **Chegg Mate**. These tools help students by providing explanations, step-by-step solutions, and guidance. Research shows that AI-based tools can improve understanding and make learning more efficient [4] (related to Socratic, Studyable, Chegg Mate). In my opinion, these tools are useful, but there is also a risk that students may become too dependent on them if they only look for answers instead of understanding the process.

Another important part is personalised learning tools like **Khanmigo** and **Duolingo**. These systems adapt to the learner's level and provide customised feedback. Research suggests that adaptive learning systems improve engagement and learning outcomes [2][5] (related to Khanmigo, Duolingo). I believe this is one of the biggest advantages of AI, because not all students learn at the same pace.

I also included collaborative learning platforms such as **Brainly**. These platforms allow students to interact with each other and share knowledge. Studies show that AI can support collaboration and improve knowledge exchange between students [4] (related to Brainly). From my perspective, this is useful because learning is not only about receiving information but also about discussing ideas.

The mind map also covers memory tools like Quizlet and problem-solving tools like **Photomath**. **Quizlet** supports revision using techniques such as repetition, while Photomath provides step-by-step solutions to maths problems. Research indicates that AI tools can improve academic performance and understanding [3] (related to Quizlet, Photomath). However, I think these tools should be used carefully to avoid over-reliance.

Question 2 : *Selected Project Idea*

The selected idea is the Smart AI Homework Assistant. This idea is based on patterns identified in research, such as improved learning outcomes and better student support [1][3][4] (related to project idea). I chose this idea because it addresses a real problem where students struggle when studying alone.

From my perspective, many students find it difficult to understand complex topics without immediate help. While traditional resources such as textbooks are useful, they do not always provide personalised explanations. An AI homework assistant can fill this gap by offering step-by-step guidance and adapting explanations to the student's level.

Another reason for selecting this idea is its practical value. Existing tools such as Socratic and Chegg already show that students benefit from instant feedback and structured explanations [4] (related to Socratic, Chegg). However, these tools sometimes focus too much on giving answers rather than developing understanding. Therefore, my proposed system will focus more on explaining the process rather than just providing solutions.

I also believe this idea has strong potential for future development. It can be expanded into a more advanced system with features such as personalised feedback, progress tracking, and adaptive difficulty levels. This makes it suitable not only for this assignment but also as a possible future project.

Overall, this project idea is relevant, practical, and aligned with current trends in AI and education, while also addressing important challenges such as independent learning and responsible use of technology.

Aim & Objectives :

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The project I have chosen is a Smart AI Homework Assistant. This idea focuses on supporting students when they are studying independently by providing explanations rather than just answers. Research suggests that AI tools can encourage independent learning and improve understanding [1] (related to selected idea).

Aim:

The aim of this project is to explore how an AI-based homework assistant can improve students' understanding and support independent learning.

Objectives:

1. To review how existing AI tools support students with homework and difficult topics [1].
2. To analyse the role of intelligent tutoring systems and personalised learning [2][6].
3. To design a concept for an AI tool that explains solutions step by step [3][4].
4. To evaluate features of existing tools such as Socratic and Chegg [4].
5. To identify ethical issues such as data privacy and over-reliance on AI [5].

Research Philosophy :

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For this project, I selected pragmatism as the research philosophy. I chose this approach because it allows the use of both quantitative and qualitative data [6]. In my opinion, this is important because I need to measure both student performance and student experience.

Pragmatism focuses on practical solutions to real-world problems [2]. It is suitable for this project because it allows flexibility in choosing research methods.

Compared to positivism (which focuses on numerical data) and interpretivism (which focuses on human experience), pragmatism combines both approaches. This makes the research more balanced and suitable for studying AI in education.

Search Tools & Search Strategy :

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To find relevant sources, I used platforms such as Google Scholar, IEEE Xplore, SpringerLink, and ScienceDirect [3].

I used keywords such as “AI learning tools”, “intelligent tutoring systems”, and “adaptive learning systems” [5], as well as search combinations like “AI AND education” [1].

I also applied filters such as publication date (2019–2026) to ensure the sources are up to date [3].

Research Strategies :

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Question 1 : **Validity, Reliability, Generalisability & Ethics**

(Based on Unit 2 Topic 2 – Finding a Needle in a Haystack)

1. Validity

To ensure validity, I will design test questions that directly measure student understanding rather than simple recall [7]. I will also use multiple methods such as tests and surveys to triangulate the results and increase accuracy [7]. In addition, I will conduct a pilot study to identify unclear questions and adjust them before the main research begins [8]. Using both pre-test and post-test measures will allow me to clearly compare learning before and after using the AI tool [9].

2. Reliability

To improve reliability, all participants will complete the same tasks under similar conditions with clear and consistent instructions [9]. I will use digital tools (e.g., online forms) to reduce human error and standardise data collection [10]. I will also apply a test–retest approach with a small group to check if the results are stable over time [10]. In addition, I will use simple Likert-scale questions to ensure responses are consistent and easy to interpret [7].

3. Generalisability

To improve generalisability, I will include students from different backgrounds, levels, and study habits rather than selecting only a specific group [7]. I will also aim for a reasonable sample size (around 15–20 participants) to make the findings more representative [9]. Furthermore, I will clearly describe the research context and process so that the study can be repeated or compared with other research [8]. Avoiding bias in participant selection will help ensure the results are applicable to a wider student population.

4. Ethical Considerations

Ethical considerations are essential because this project involves student data and AI interaction. I will ensure that all participants provide informed consent before taking part in the study [11]. Personal data will be kept anonymous and confidential at all times [11]. Participants will also have the right to withdraw from the study at any stage without any negative consequences [11].

In addition, I will ensure that the AI tool supports learning rather than completing tasks for students, to avoid academic misconduct [8]. I will also consider risks such as algorithmic bias and incorrect AI responses, and take steps to monitor and minimise these issues [10]. This helps ensure that the research remains fair, safe, and responsible.

Research Strategies :

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Question 2 : *Data Collection Methods and Pilot Study*

(Based on Unit 2 Topic 2 – Finding a Needle in a Haystack)

1. Data Collection Methods

To collect useful and relevant data, I will use a mixed-method approach:

- **Online surveys** to measure students' opinions and experiences when using the AI tool [7]
- **Pre-test and post-test** to measure actual learning improvement [8]
- **Short written reflections** to understand how students feel about the tool and how it affects their learning [11]
- **System usage logs (optional)** to track how often and how long students use the tool [10]

Using both quantitative and qualitative methods is important because numerical data alone cannot fully explain student experience. Combining both types of data provides a more complete understanding of the impact of the AI tool.

Pilot Study:

Before the main study, I will conduct a pilot study with 3–5 students. The pilot will include a pre-test, a short session using the AI tool, and a post-test followed by a survey.

The purpose of the pilot study is to identify problems such as unclear questions, poor timing, or confusing instructions. Feedback from participants will be used to improve the design of the research [7][8][11]. For example, if students find questions too long or unclear, I will simplify them. This process helps improve both validity and reliability before the full study is conducted.

Research Strategies :

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Question 3 : Quantitative and Qualitative Analysis

*(Based on Unit 4 Topic 1 – It's All in the Numbers
and Unit 4 Topic 2 – There's a Theme Here)*

Quantitative analysis:

For numerical data, I will use descriptive statistics such as mean, median, and percentage improvement to analyse test scores [9]. This will help show whether students improved after using the AI tool. I will also use charts such as bar graphs or line graphs to present the data clearly and make it easier to understand [10].

Qualitative analysis:

For textual data (e.g., student reflections), I will use thematic analysis to identify common patterns and ideas [11]. For example, themes such as “better understanding” or “confusion” may appear in responses. I will also use coding to group similar responses together and analyse trends more effectively [8].

Using both quantitative and qualitative analysis is important because it allows me to measure not only how much students improve, but also how and why the AI tool affects their learning. This combined approach provides deeper insight into the effectiveness of the AI-powered learning tool and helps create a more complete understanding of the student experience.

Pilot Study :

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1. Pilot Test Questions (Sample)

- Q1: How confident do you feel before using the AI tool?
- Q2: Solve this short problem: _____
- Q3: After using the AI tool, how clear was the explanation?
- Q4: Rate your understanding before and after (1–5).
- Q5: What part of the AI tool was most helpful?

2. Pilot Process (Summary)

The pilot study was tested with 3–5 students.

They completed a pre-test, used the AI tool, and then completed a post-test and a short survey.

3. Pilot Feedback (Student Comments)

Student 1:

- Some questions were too long → shortened
- Instructions were not very clear → rewritten
- Needed more time → increased test time

Student 2:

- AI explanations were helpful
- Post-test felt harder than pre-test
- Liked personalised responses

Student 3:

- Survey was easy to complete
- Wanted more examples in test
- AI tool felt easy to use

4. Changes Made After Pilot Study:

- Improved clarity of instructions
- Reduced length of pre/post test
- Added one example question
- Adjusted time limit
- Improved layout of survey

[1]

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W. S. Basri, "Title unknown," *Eurasian Journal of Educational Research (EJER)*, 2024. Accessed via EBSCOhost.

(Duplicate—allowed if cited separately in Task 3)

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