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Prifysgol Cymru
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Coursework Title

Module Name: Changemakers: Creativity and Value
Creation

Module Code: ACCA5033

Component 1: Innovation & Research

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Task 1-Ideation and Mind Map

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Ideation

Creativity and innovation have played a significant role in transforming many aspects of society, including healthcare, business, and education. Recent developments in artificial intelligence (AI) have created new opportunities to improve learning experiences and provide personalised support for students. According to [1], generative AI technologies are becoming increasingly important within education, offering opportunities to enhance learning while also presenting challenges related to ethics and responsible use. Similarly, UNESCO highlights that AI has the potential to support teaching and learning by providing accessible and adaptive educational tools [2].

As a Computing Science student, I am particularly interested in areas related to artificial intelligence, software development, and human-computer interaction. Several project ideas were initially considered, including an intelligent study planner, a programming support chatbot and an AI-powered academic support assistant. These ideas were selected because they combine emerging technologies with real-world problems experienced by university students.

Research has shown that artificial intelligence is becoming increasingly integrated into higher education and has the potential to improve student engagement and learning outcomes [3]. Furthermore, students are already using AI tools such as ChatGPT to support their studies, demonstrating growing acceptance of AI technologies in educational environments [4].

After considering different ideas, the project titled "Design and Development of an AI-Powered Academic Support Assistant for University Students" was selected. The proposed system aims to provide students with support in areas such as revision planning, resource recommendations, and academic guidance. This project aligns with the principles of design thinking, which emphasise understanding user needs and developing innovative solutions to real-world problems [5].

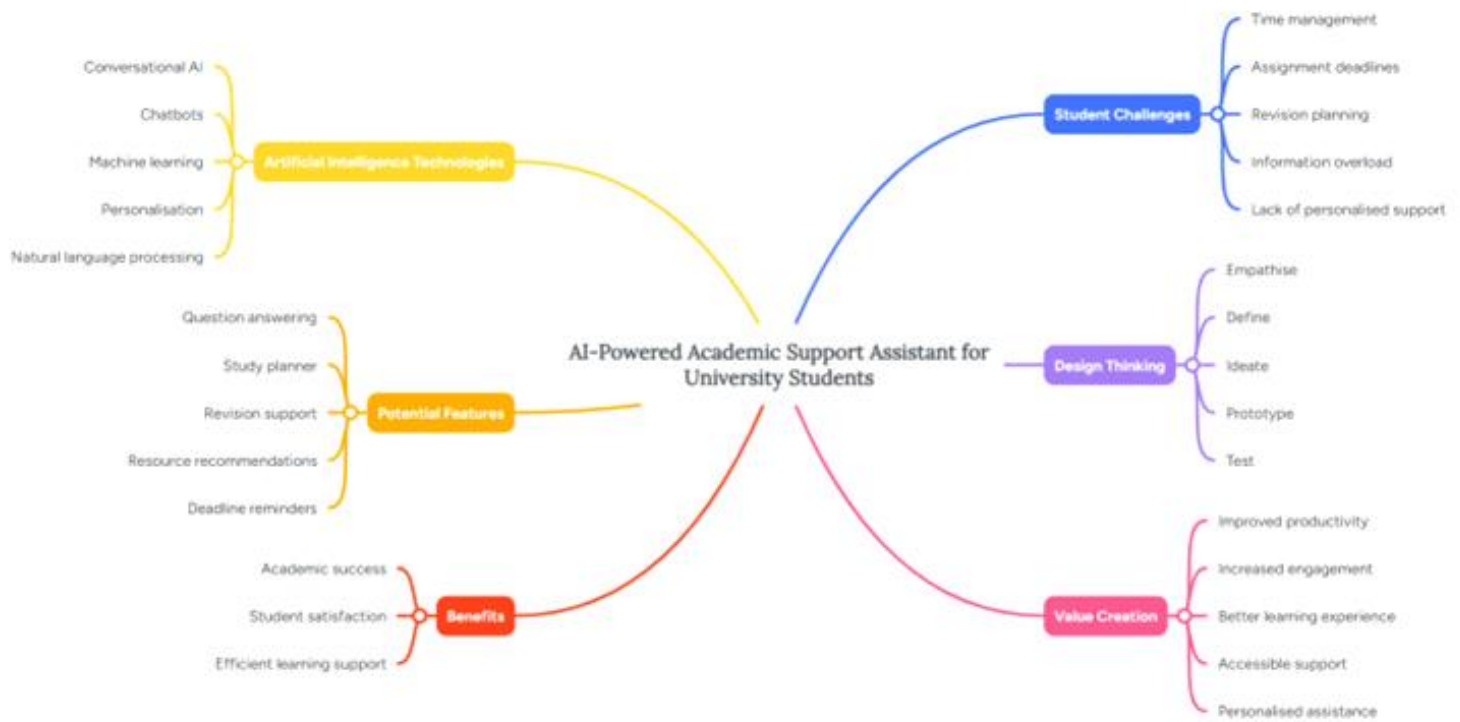


Figure 1: Mind Map

Mind Map Explanation

The mind map was created to organise and visualise ideas related to the proposed project. Several factors that influence the development of an AI-powered academic support assistant were identified. These include challenges faced by university students, current artificial intelligence technologies, design thinking principles, and the potential value that such a system could create.

The "Student Challenges" branch highlights common issues experienced by students, including time management, revision planning, and information overload. These problems provide motivation for developing a support system that can offer personalised guidance. The "Artificial Intelligence Technologies" branch focuses on technologies such as conversational AI, machine learning, and natural language processing, which form the basis of modern educational chatbots.

The "Design Thinking" branch demonstrates how user-centred design can be applied throughout the project by understanding user needs, generating ideas, and testing potential solutions. The "Potential Features" branch identifies functions that may improve the student learning experience, including revision support, study planning, and resource recommendations. The "Value Creation" branch shows how the proposed system could contribute to improved productivity, increased engagement, and better access to academic support. In addition, the "Benefits" branch highlights the positive impact that the system could have on academic success, student satisfaction, and efficient learning support.

Task 2-Aim & Objectives and Research Area

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Research Area

Artificial intelligence has become increasingly important in higher education and is changing how students interact with learning resources and receive academic support. Recent developments in conversational AI have enabled intelligent systems to provide personalised assistance, immediate responses, and improved accessibility for students. AI-powered academic assistants are becoming an emerging area of research because they offer opportunities to enhance the learning experience and provide support outside traditional classroom environments [6].

Research has shown that integrating AI technologies into higher education can positively influence student success and engagement. Llanos et al. demonstrated that virtual assistants could provide additional support for students and contribute to improved learning outcomes [7]. Furthermore, a systematic review conducted by Kuhail et al. highlighted the growing use of educational chatbots and their ability to support communication, increase engagement and enhance learning experiences [8].

Other studies have demonstrated that AI-based student assistants can improve learning through interactive support and immediate feedback mechanisms [9]. At the same time, Chen et al. emphasised the importance of designing AI assistants that focus on student success and user-centred interactions [10]. In addition, recent research has highlighted the importance of explainable and human-centred AI approaches, which improve trust, transparency, and personalisation in educational chatbot systems [11]. As educational institutions continue to adopt artificial intelligence technologies, there is increasing potential for AI-powered systems to support students more effectively and create value within higher education environments [12]. Moreover, educational chatbots have already been successfully applied to programming courses, demonstrating their ability to support specific learning requirements and improve student engagement [13].

Aim

This project aims to investigate the design and potential effectiveness of an AI-powered academic support assistant that provides personalised learning support and improves academic organisation for university students.

SMART Objectives

To achieve the aim of the project, the following SMART objectives have been identified.

Objective 1: Investigating Student Academic Challenges

To investigate the academic challenges experienced by university students and identify areas where artificial intelligence can provide additional support through literature review and user feedback.

Objective 2: Reviewing Existing AI Technologies and Educational Chatbots

To examine current conversational AI technologies and existing educational chatbot systems used within higher education to identify suitable approaches for the proposed solution.

Objective 3: Identifying User Requirements and System Features

To identify user requirements and preferred features by conducting primary and secondary research and analysing existing AI-based educational systems [9], [10].

Objective 4: Designing a Conceptual AI-Powered Academic Support Assistant

To design a conceptual prototype of an AI-powered academic support assistant that incorporates human-centred and explainable AI principles to improve usability, transparency, and personalisation.

Objective 5: Evaluating User Acceptance and System Effectiveness

To evaluate the potential usefulness and acceptance of the proposed system through quantitative and qualitative data collection methods and compare the findings with existing educational chatbot applications. These objectives are considered SMART because they are specific, measurable, achievable, relevant and time bound.

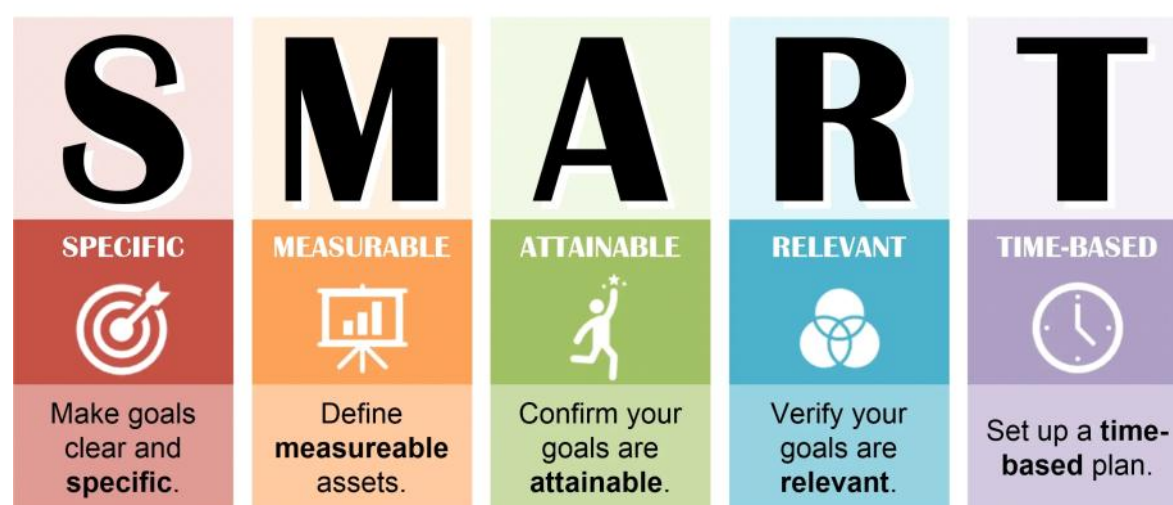


Figure 2: Smart Objective Explanation

Research Philosophy

The research philosophy adopted for this project is pragmatism. Pragmatism is concerned with addressing practical problems and selecting research methods based on their ability to answer research questions effectively. Unlike philosophies that rely solely on either objective or subjective perspectives, pragmatism allows researchers to use different approaches to obtain a more complete understanding of a problem. According to R. King, pragmatism is particularly valuable in educational research because it focuses on producing practical solutions and encourages the integration of different research methods[14].

A pragmatic approach is considered appropriate for this project because the

purpose of the proposed AI-powered academic support assistant is to address challenges experienced by university students. The project aims to investigate how artificial intelligence can be used to improve academic support and learning experiences rather than focusing only on theoretical concepts. Therefore, understanding both measurable trends and user experiences is essential for developing an effective solution.

Pragmatism also supports the use of mixed research methods, allowing quantitative and qualitative approaches to be combined. Quantitative methods provide measurable information regarding user requirements, feature preferences, and levels of acceptance, while qualitative methods provide deeper insights into student experiences, expectations, and perceptions. Şahin and Öztürk state that mixed methods research combines the strengths of both approaches and provides a more comprehensive understanding of research problems[15].

Furthermore, pragmatism provides flexibility when selecting suitable methods and encourages researchers to focus on answering the research question rather than following a single methodological approach. Foster[16] argues that methodological pragmatism enables researchers to combine exploratory and confirmatory approaches, allowing different forms of evidence to complement one another.

Pragmatism provides an appropriate philosophical foundation for this project because it supports problem-solving, encourages methodological flexibility, and allows the integration of quantitative and qualitative data which make it well-suited to the investigation and design of an AI-powered academic support assistant.

Search Tools and Databases

To identify reliable and relevant literature related to artificial intelligence and educational technology, academic research was conducted using Google Scholar and IEEE Xplore. These search tools were selected because they provide access to peer-reviewed journal articles and conference papers, ensuring that the information used throughout the project is credible and academically dependable.

Google Scholar

Google Scholar was used to search for journal articles, conference papers and highly cited publications related to artificial intelligence, educational chatbots and higher education. The platform provides access to research from various publishers and allows results to be filtered according to relevance and publication date. It was particularly useful for locating review papers and identifying commonly referenced studies within the field.

Google Scholar

"educational chatbot" AND university students



☒ Articles ☐ Case law

New! Scholar Labs update: Search 10x faster, 3x deeper

Stand on the shoulders of giants

Figure 3: Google Scholar search query using Boolean operators.

The search term **"educational chatbot" AND university students** was used to locate studies related to chatbot applications in higher education. Figure 1 shows the search query used in Google Scholar, while Figure 2 presents examples of the search results obtained.

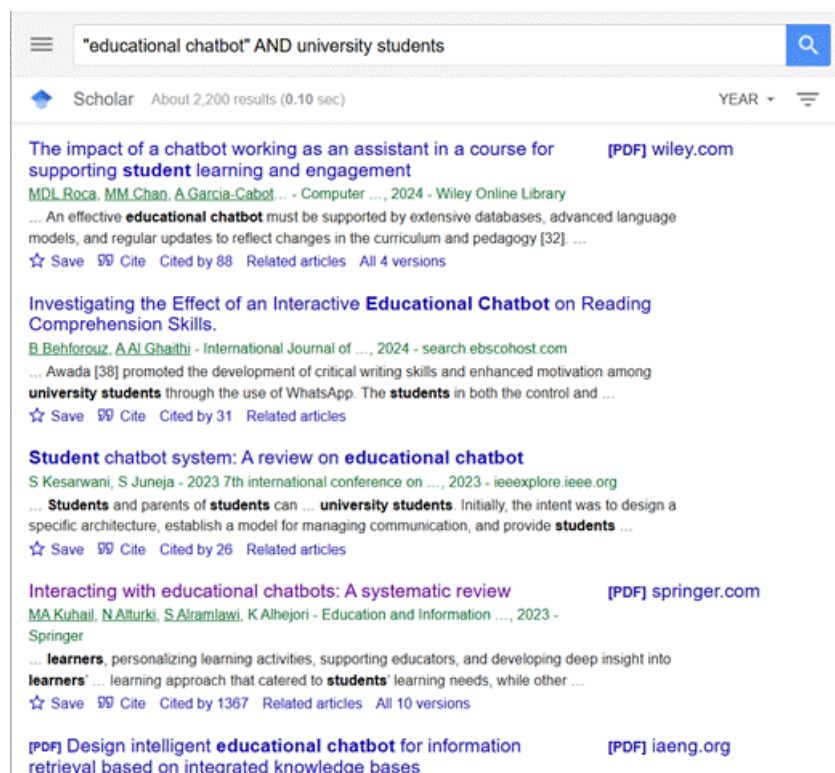


Figure 4: Search results obtained from Google Scholar

IEEE Xplore

IEEE Xplore was used as the primary source of literature because it contains peer-reviewed articles and conference proceedings related to computer science, software engineering, and artificial intelligence. Since the proposed project focuses on AI technologies and conversational systems, IEEE Xplore provided

technically relevant and up-to-date research. Many of the studies selected for this project were obtained from IEEE Xplore due to their relevance to educational chatbots and AI-powered learning systems.

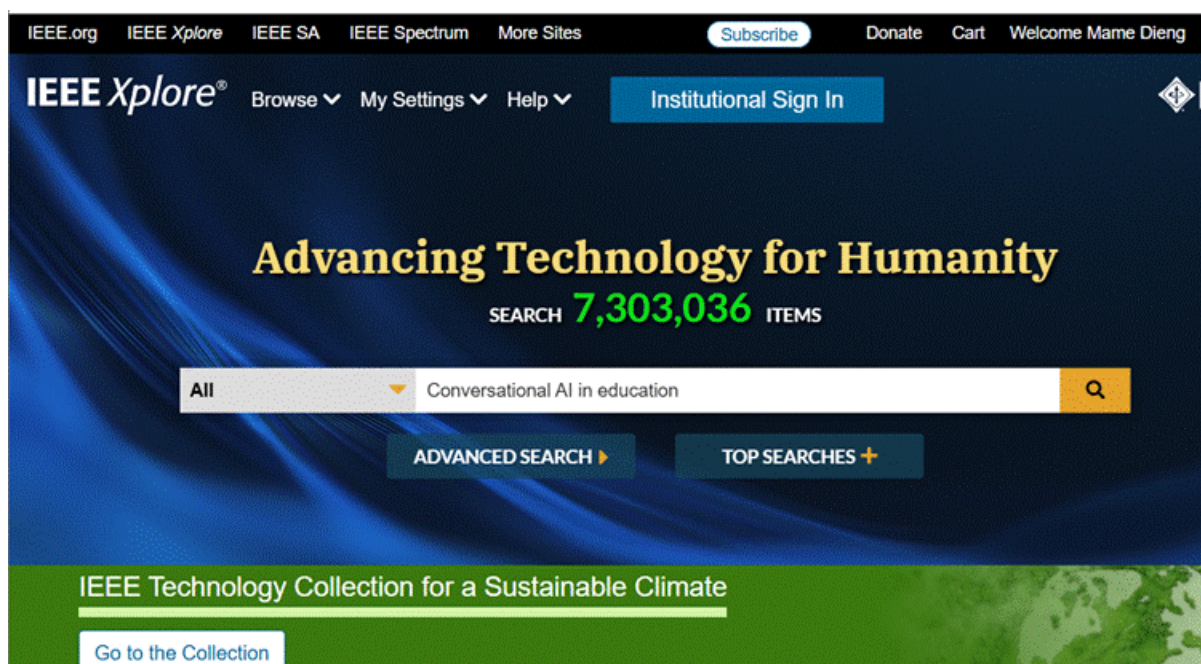


Figure 5: IEEE Xplore search query for conversational AI in education.

The search term "**Conversational AI in education**" was used, and the publication period was restricted to **2020–2026** to ensure that only recent studies were considered. Figure 3 illustrates the search query used within IEEE Xplore, while Figure 4 shows examples of the search results obtained.

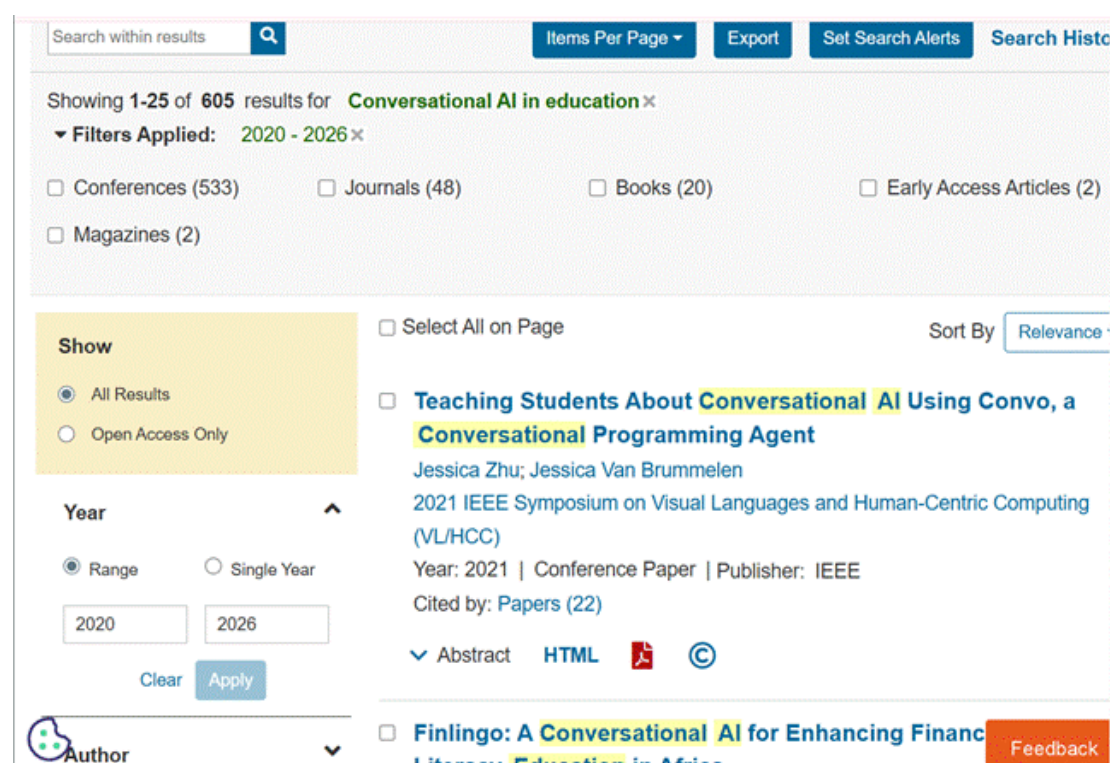


Figure 6: IEEE Xplore search results filtered between 2020 and 2026.

Search Strategy

A systematic search strategy was adopted to identify relevant studies associated with AI-powered academic assistants and educational chatbots. Several keywords were selected based on the project topic and refined using Boolean operators to improve the quality and relevance of the search results.

Keywords

The following keywords were used during the literature search process:

- AI-powered academic assistant
- Educational chatbot
- Conversational AI in education
- Artificial intelligence in higher education
- Student learning support systems
- Personalised educational chatbots
- AI student assistants
- Virtual assistants in higher education

Boolean Operators

Boolean operators were used to combine keywords and narrow the search results. Examples of search queries included:

- ("Artificial Intelligence" AND education)
- ("Educational Chatbot" AND university students)
- (Chatbot OR conversational AI) AND learning support
- ("AI assistant" AND higher education)
- ("Virtual assistant" AND student success)
- ("Personalised chatbot" AND education)

Selection Criteria

To ensure that the literature used in this project was relevant and dependable, several selection criteria were applied. Priority was given to peer-reviewed journal articles, books and conference papers published between 2020 and 2026. Studies focusing on artificial intelligence, conversational AI, educational chatbots and student support systems were considered particularly relevant. Duplicate studies and papers unrelated to higher education were excluded from the review. This search strategy ensured that the literature selected for the project was both academically credible and related to the development of an AI-powered academic support assistant for university students.

Task 3-Research Strategy

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Validity

Validity refers to the extent to which the research accurately measures what it is intended to investigate. To improve validity, the questionnaire will be designed based on the project objectives and will focus specifically on students' academic challenges and their perceptions of AI-powered support systems. A pilot study will be conducted before distributing the final questionnaire to ensure that the questions are clear and relevant. Evaluating user experience is important when investigating the adoption of innovative technologies and can help reveal users' perceptions and acceptance [17].

Reliability

Reliability refers to the consistency of the research process and the ability to obtain equivalent results if the study is repeated. To improve reliability, all participants will receive the same questionnaire containing closed-ended questions. Standardising the data collection process helps ensure consistency and reduces the possibility of bias. Similar approaches have been used to evaluate the impact of educational chatbots on student learning experiences [18].

Generalisability

Generalisability refers to the extent to which the findings can be applied to a wider population. The target participants for this study are university students from different courses and levels of study. Although the sample size may be limited, collecting responses from a diverse group of students can improve the applicability of the findings and provide insights into the wider use of AI-powered support systems in higher education [19].

Ethical Considerations

Ethical considerations are important when conducting research involving participants. Participation in the questionnaire will be voluntary, and respondents will remain anonymous. No personal or sensitive information will be collected, and all data will be used solely for academic purposes. Participants will also have the right to withdraw from the study at any time. These measures help ensure that the research is conducted responsibly and ethically [20].

Data Collection Methods

Primary data will be collected through an online questionnaire distributed to university students. The questionnaire will consist entirely of closed-ended questions, including multiple-choice and Likert-scale questions. This approach allows responses to be collected efficiently and analysed quantitatively. Previous studies have shown that AI-powered educational systems can positively influence student learning experiences, making student perceptions a major area of investigation [21].

A pilot questionnaire was distributed to a small number of university students to evaluate the clarity and suitability of the questions. Feedback obtained from the pilot study was used to make minor improvements to the questionnaire. The final questionnaire and a summary of the pilot feedback are provided in Pilot

Data Analysis

Quantitative Analysis

Since the questionnaire consists entirely of closed-ended questions, quantitative analysis will be used to analyse the collected data. Descriptive statistics such as frequencies, percentages and charts will be used to identify patterns and trends in students' responses. These methods will provide measurable insights into students' academic challenges and their perceptions of an AI-powered academic support assistant.

Qualitative Analysis

Although this project uses quantitative methods, qualitative analysis is another common research approach. Techniques such as thematic analysis and content analysis are used to identify patterns and themes within textual data. These methods can provide deeper insights into user experiences and opinions and are widely used in educational research.



Figure 7: Research Strategy

Appendix Page

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Pilot Questionnaire

The pilot questionnaire was designed to collect information about students' academic challenges and their opinions regarding an AI-powered academic support assistant. The questionnaire consisted entirely of closed-ended questions to facilitate quantitative analysis.

Q1. What is your current level of study?

- ☐ Year 1
- ☐ Year 2
- ☐ Year 3
- ☐ Postgraduate

Q2. How often do you struggle with managing your academic workload?

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Often
- ☐ Always

Q3. Have you used AI tools (e.g., ChatGPT or Copilot) for academic purposes?

- ☐ Yes
- ☐ No

Q4. Which feature would you find most useful in an AI-powered academic assistant?

- ☐ Revision support
- ☐ Study planning
- ☐ Resource recommendations
- ☐ Deadline reminders

Q5. How important is personalised academic support to you?

- ☐ Not Important
- ☐ Slightly Important
- ☐ Moderately Important
- ☐ Very Important
- ☐ Extremely Important

Q6. Would you find a chatbot that answers academic questions useful?

- ☐ Yes
- ☐ No
- ☐ Not Sure

Q7. How useful would deadline reminders be?

- ☐ Not Useful
- ☐ Slightly Useful
- ☐ Moderately Useful
- ☐ Very Useful
- ☐ Extremely Useful

Q8. Would you like the system to recommend learning resources?

- ☐ Yes
- ☐ No
- ☐ Not Sure

Q9. How comfortable would you feel using AI to support your studies?

- ☐ Very Uncomfortable
- ☐ Uncomfortable
- ☐ Neutral
- ☐ Comfortable
- ☐ Very Comfortable

Q10. Would you use an AI-powered academic support assistant if it were available at your university?

- ☐ Definitely Not
- ☐ Probably Not
- ☐ Not Sure
- ☐ Probably Yes
- ☐ Definitely Yes

Pilot Feedback

A pilot questionnaire was distributed to four university students to evaluate the clarity and relevance of the questions before conducting the main study.

Participant	Feedback
Student 1	The questions were clear and easy to understand.
Student 2	Suggested adding more examples of AI tools to Question 3.
Student 3	Thought the questionnaire length was appropriate and easy to complete.
Student 4	Recommended including additional options for useful features.

Improvements Made Following the Pilot Study.

Based on the feedback received, minor modifications were made to improve the clarity of the questionnaire. Examples of AI tools were added to Question 3, and the wording of several questions was simplified to ensure that participants could understand them easily. These changes improved the overall quality of the questionnaire and helped increase the validity and reliability of the data collection process.



Figure 8: Poster for the AI-power Support Assistant

AI-powered academic support assistant Timeline

Gantt Chart

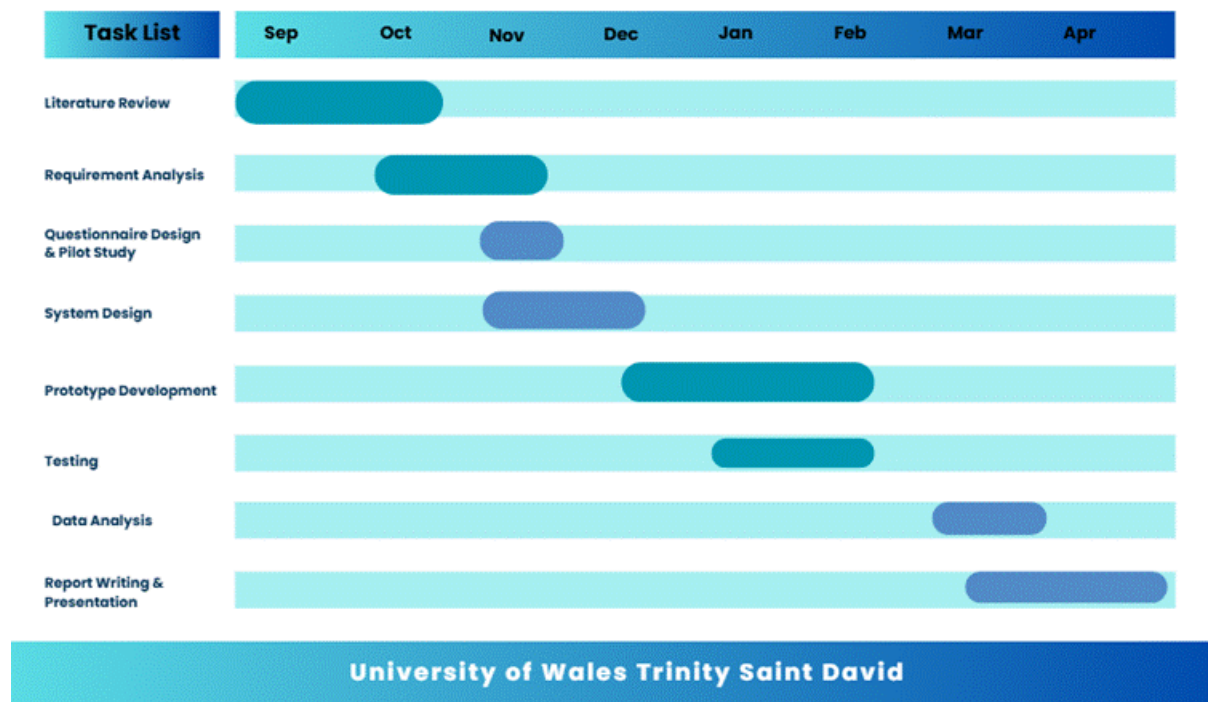


Figure 9: Gant Chart for the project

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