

Module: Network Operating Systems and Services

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Assignment Title: Configure and manage the Virtualised Enterprise network

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Task 1: Ideation & Mind Map



Creativity, Innovation, and Society

Creativity and innovation drive societal progress by transforming ideas into solutions that enhance learning, productivity, and wellbeing (Qureshi, 2023). In STEM education, innovative tools promote curiosity, experimentation, and problem solving. Rogers' diffusion theory explains how innovations spread when they demonstrate advantage, compatibility, and observability (verbye-Thompson and Hamilton, 2025), supporting the unit theme that innovation shapes both society and individual development positively globally.

Personal Interests in STEM and Cloud Computing

Personal interests in computing, cloud platforms, and educational technology align with developing intelligent tutoring systems and AI-driven feedback improves conceptual understanding and learner confidence in mathematics and science (Adayilo et al., 2026). Cloud computing enables scalable deployment, real-time analytics, and collaborative innovation across institutions, supporting inclusive access to high-quality STEM learning environments worldwide and lifelong skills development.

Ethics and Responsible Innovation

Responsible innovation requires addressing ethics, privacy, transparency, and algorithmic bias when deploying AI in education (European Commission, 2025). Learner data must be protected while ensuring fairness and inclusivity in automated feedback systems (Qureshi, 2023). Embedding ethical governance into system design builds trust, accountability, and social acceptance, aligning technological progress with human-centred values and sustainable educational development goals globally.

Selected Project Idea

The selected project is an Intelligent STEM Learning Support System using cloud-based AI tools to deliver adaptive tutoring, automated assessment, and personalised analytics. Machine learning models diagnose misconceptions and recommend targeted resources (Adayilo et al., 2026). Cloud services provide scalable infrastructure, interoperability, and continuous improvement, embodying innovation through creativity, technical integration, and meaningful educational impact globally.

Expected Educational and Societal Impact

The system aims to improve engagement, retention, and mastery in STEM by providing responsive, learner-centred support and educators gain actionable analytics to personalise instruction and intervene effectively. At a societal level, enhanced STEM capacity supports workforce readiness, innovation ecosystems, and sustainable development goals (European Commission, 2025), demonstrating how educational technologies shape both individual opportunity and collective prosperity for societies.

Technologies and System Architecture

The system architecture uses microservices, containerisation, and API integration to connect learning platforms, analytics engines, and conversational agents (Pandiya and Charankar, 2025). Real-time data pipelines support model training, monitoring, and dashboard visualisation. Interoperability standards ensure compatibility across institutions, enabling rapid experimentation, scalable deployment, and sustainable maintenance, while fostering continuous innovation in global digital education ecosystems worldwide for learners and educators.

Creativity and Self-Development

Engaging with innovative learning systems fosters creativity, autonomy, and lifelong learning habits among students (Overbye-Thompson and Hamilton, 2025), and adaptive technologies encourage exploration, reflection, and resilience by responding to individual needs. This aligns with theories of self-directed learning and innovation diffusion, where individuals adopt tools that demonstrate usefulness and compatibility with goals (Qureshi, 2023), strengthening personal growth alongside academic achievement in modern education.

References:

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Task 2: Aim, Objectives, and Research Area

Q1. Project Aim and Objectives

Project Aim:

The aim of this project is to design and test an Intelligent STEM Learning Support System which uses the cloud-based artificial intelligence applications to promote student engagement, conceptual learning, and academic achievement in the secondary and lower tertiary education environment.

Objectives:

1. To determine the key areas of learning problems among the students in STEM disciplines based on a thorough needs analysis and curriculum study.
2. To create an AI-driven learning environment built on the cloud and providing adaptive feedback and personalized content.
3. To create a working prototype that encompasses machine learning models to detect misconceptions and provide customised learning recommendations.
4. To assess the effectiveness of the system through the analysis of the data on the performance of learners and usability testing.
5. To measure ethical, privacy, and data-security requirements, which are relevant to its responsible deployment.

Q2. Research Philosophy

The suitable research philosophy to apply in this question is pragmatism, which is a focus on practical problem-solving and the utilisation of the research method that would be most effectively applied to tackle the challenges of the real world (Brister, 2024). Such a position does not deny the possibilities of the combination of both quantitative methods that include the analysis of the metrics of learner performance with qualitative methods that include the semi-structured interviews, usability tests, and learner feedback (Dube et al., 2024). Oppositely, computing and educational technology study is especially pragmatic because the flexibility and responsiveness of system development are essential to meet the changing needs of users and align with the innovation-oriented environment that demands to be proven to be technically effective and capable of education (Christensen, 2022). Besides, a pragmatic orientation also promotes the cyclical design and improvement, which makes it possible to refine the system on the basis of empirical data and stakeholder feedback (Tetteh, 2024). This practise would therefore mean that the findings of the research would be relevant, applicable and strongly anchored on the situation of real educational practise.

Q3. Research Tools, Databases, and Search Strategies

The process of identifying the relevant literature will consist of the systematic use of various scholarly databases and advanced search tools. In Google Scholar, there is wide access to peer-reviewed articles and theses in journals and conference papers. Wang et al. (2022) observe that the high quality of technical research about artificial intelligence, machine learning and cloud computing systems can be obtained in IEEE Xplore and the ACM Digital Library, whereas Scopus allows one to track citations and conduct systematic reviews, and ERIC concentrates on education and learning sciences studies.

Search strategies will include Boolean operators, phrase searching, and truncation techniques. Example search queries include:

- “artificial intelligence in education” AND STEM AND cloud computing
- “intelligent tutoring systems” AND adaptive learning
- “educational data privacy” AND AI ethics

The filters will also be used to limit the results to the publications of 2015-2025 that are peer reviewed. The citation chaining tool will be used to find powerful research and theoretical models. This systematic practise will keep the research base up to date, trustworthy and directly relevant to the technical and pedagogical goals of the project.

References

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Task 3: Research Strategies

Q1. Validity, Reliability, Generalisability, and Ethics

To enhance the construct validity, the research will resort to triangulation by combining system usage analytics with the scores of the learning performance and the survey feedback, thus, making sure that the collected data will reflect learning outcomes accurately (Arizmendi et al., 2023). The internal validity will be strengthened by the use of a pre-test/after-test design in which learning gains that could be attributed to the artificial-intelligence system could be measured (Donkor et al., 2025). To guarantee reliability, standardised assessment tools, uniform survey tools, and automatic recording of the interactions between the learner will be used, all of which will reduce the risk of human error and increase consistency between the data-collection cycles (Ahmed et al., 2023). These instruments and procedures will also be refined before being implemented fully through pilot testing.

The sampling of learners across various modules in STEM and year of study will also support generalisability by enhancing population heterogeneity and external validity (Thomas, 2023). System design and learning conditions will be well documented which will aid in transferability of the findings to similar learning environments. Such ethical aspects as informed consent and voluntary participation, anonymisation of the learner data, and compliance with the requirements of GDPR will be considered (UK Data Service, 2024). An ethical consent will be obtained prior to the commencement of data collection and the subjects will have the right to withdraw at any point without any penalty.

Q2. Research Strategies and Pilot Data Collection

The mixed-methods research strategy will be adopted to assess the learning outcomes and user experience. Quantitative data will be received by means of pre- and post-testing, the use of systems, and Likert-scale questionnaires, whereas qualitative data will be collected using semi-structured interviews and open-ended survey questionnaires.

The pilot study will involve ten undergraduate STEM students who will communicate with the AI learning system during one week. After this time, the subjects will be asked to fill in a brief online survey and a usability walkthrough exercise, which will evaluate the clarity, functionality and relevance of the feedback capabilities. To be informed by this pilot, assessment items and interface design as well as data-collection tools will be refined before full-scale implementation (Saunders et al., 2019). (See Appendix A for pilot survey sample.)

Q3. Quantitative and Qualitative Data Analysis

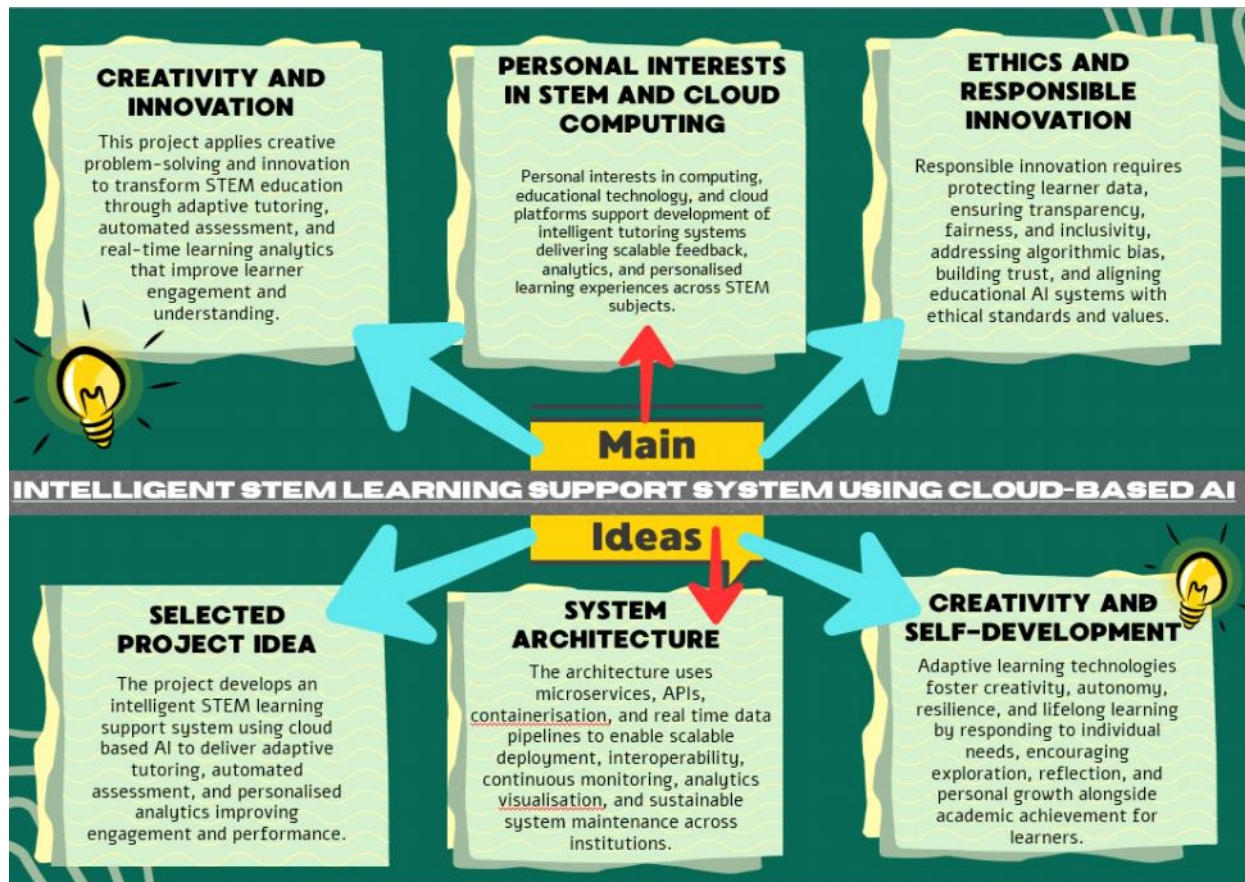
Descriptive statistics (means and standard deviations) will be used in quantitative analysis of the results, paired-sample t-tests will be used to analyse changes in learning, and correlation will be used to analyse the relationship between the frequency of system use and performance improvement (South et al., 2022). Misconception engagement patterns and trends will be represented as learning analytics dashboards.

A qualitative analysis will be performed using a six-stage framework of Braun and Clarke (2006) to perform a thematic analysis of the interview transcripts and responses to open-ended survey questions. The phases will include familiarisation, coding, theme development, review, definition, and reporting (Guraya et al., 2025). This approach to the method will help to establish habitual trends in the perceptions of usability, motivation, and instructional effectiveness of learners. The combination of quantitative and qualitative pieces of information will facilitate the process of triangulation, which will subsequently contribute to the strength of the conclusions and facilitate the evidence-based optimization of the system (Donkor et al., 2025).

References

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POSTER



Appendix

A: Pilot Data Collection Instrument (Sample)

Pilot Survey Questions (Post-Use Evaluation)

1. On a scale of 1–5, how useful was the AI feedback in improving your understanding?
2. Which features helped you most, and why?
3. Were any explanations unclear or confusing? Please explain.
4. Did the system improve your confidence in solving STEM problems?
5. What improvements would you suggest for future versions?