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## Developing a framework to guide university educators designing AI-powered study support tools: A work in progress


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This paper introduces a MPhil research project aimed at developing a framework to facilitate university educators, particularly non-technical users, in designing Generative AI (GenAI)-powered study support tools for regional, rural, and remote (RRR) students. The framework will guide the customisation of AI chatbots (AI-SUPBOT) that provide scaffolded academic support while upholding academic integrity. Grounded in Technological Pedagogical Content Knowledge (TPACK) and Design-Based Research (DBR) principles, the framework aims to offer a structured, pedagogically sound path for integrating GenAI in higher education.



*Keywords:* guiding framework, Generative AI, study support, regional students, AI customisation, custom chatbot, design research


## Introduction

The rapid advancement of Generative AI (GenAI) holds significant promise for transforming study support in higher education (HE) by offering instant feedback, interactive communication, 24/7 availability, and powerful adaptability to specific learning objectives. These affordances address long-standing limitations of human-dependent approaches, such as restricted access, limited availability and capability of tutors, and time-bound support (Boulton, 2023). Emerging projects across disciplines have demonstrated that GenAI-powered tools can be effective, even outperform traditional support (Jabbour et al., 2025; Kestin et al., 2024; Qadir, 2025). Despite this potential, adoption of GenAI in HE remains limited. A key challenge is the need to meaningfully integrate GenAI technologies with pedagogical knowledge, curriculum-specific content, and learning context, positioning educators as central agents of innovation. However, many educators lack the GenAI literacy, technical skills, or design methodologies required to confidently engage in this work (Lee et al., 2024). This underscores the urgent need for practically adoptable frameworks that enable educator-designers to make theoretically grounded and pedagogically sound decisions throughout the development process.

This study addresses this gap by presenting a procedural framework (AI-SUPBOT) that guides the design of support tools for online study in RRR contexts especially. Students from RRR areas face distinct challenges, including limited access to academic support, lack of academic experience or preparation for higher education, digital divide, and feelings of isolation (Davis & Taylor 2019). These factors are compounded in online learning environments, where the absence of timely, personalised assistance can significantly impact engagement and retention. Targeted support tools are therefore essential to help RRR students navigate academic expectations and succeed in their studies. This paper reports on the first stage of this work: the development of the initial framework grounded in theoretical analysis and a review of relevant literature.

## TPACK framework and DBR principles as analytical lenses

TPACK emphasises the importance of three knowledge components for technology integration: Content Knowledge (CK), Pedagogical Knowledge (PK) and Technology Knowledge (TK), along with the dynamic interplays between/among them (Koehler et al., 2013). It focuses on equipping educators to effectively integrate technology into subject-specific teaching. Recent extensions of the framework include Context Knowledge (XK) as an important component (Petko et al., 2025). This study will explore educator TPACK for AI-SUPBOT through focused literature investigations, addressing the key question: what constitutes the customisation of GenAI chatbots and how they can be used for AI-SUPBOT? The TPACK lens will also be applied in the analysis to guide educator-designers in synthesising relevant knowledge for informed design decisions. DBR principles provide a process-oriented lens that emphasises iterative refinement, collaborative process, real-world relevance, and theory-practice integration or scholarship of technology enhanced learning (Cochrane, 2022). These principles will be incorporated into the framework structure and guiding perspectives.

## Customisation of AI chatbots for study support

Customisation in this context refers to adapting a general-purpose GenAI model into a domain-specific, purpose-built educational tool. It is fundamentally an act of educational design, requiring intentional alignment of pedagogical principles, learner context, and instructional strategies (Qadir, 2025).

Several studies identify key affordances of GenAI that support customisation (e.g., Castro et al., 2025; Qadir, 2025):

- Prompt engineering and instruction tuning let educators guide chatbot behaviours.
- Context embedding and memory support continuity and personalised learning across sessions.
- Natural language interfaces enable easy customisation by non-technical users.
- Content injection allows embedding or linking course materials to align responses with curriculum.
- Adjustable constraints help maintain academic integrity by limiting inappropriate chatbot functions.

The level of customisation can range from basic setups using single-prompt instructions (e.g., the Custom GPT Chatbot by Qadir, 2025) to more advanced configurations involving layered prompting, structured interaction flows, Retrieval Augmented Generation (RAG), fine-tuning with custom datasets (e.g., SocratiQ by Jabbour et al., 2025).

## AI-SUPBOT: A GenAI study support tool design framework

AI-SUPBOT framework positions educators as active co-designers and decision-makers. It consists of 4 phases as illustrated in Figure 1. This article focuses on the first 3 phases that are directly related to the design process: (a) Define purpose & context; (b) Co-design & configure the tool with GenAI; (c) Prototype and refinements.

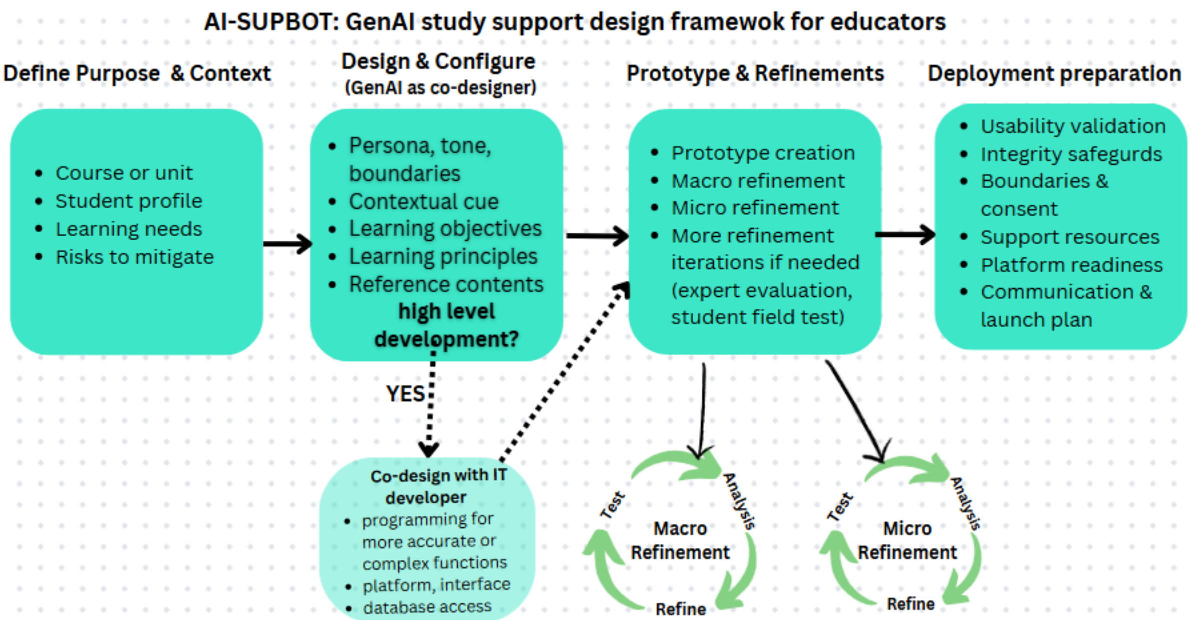


*Figure 1*. An illustrative overview of the AI-SUPBOT design process.

### Phase 1: Defining purpose and context

This initial phase is an offline step where the intent of the support tool is articulated as a set of design criteria. It includes: the specific course or subject in which the support bot will be embedded; the target student profile, such as year level, online/ RRR status, or special learning needs; the learning challenges the tool is meant to address (e.g., interpreting assignment briefs, improving academic writing, managing workload); and key constraints, such as academic integrity policies or accessibility considerations. The outcome can be a descriptive paragraph, or a list of the criteria. Here is a simple example:

> *In the Introduction to eCommerce course, AI-SUPBOT supports first-year online students from RRR areas as they prepare for their first essay assignment. It provides scaffolded guidance to help students unpack the task, plan their response, and understand academic expectations, while strictly avoiding content generation to ensure compliance with university academic integrity policies.*

This context forms the foundation for the entire design process and should be revisited and refined throughout the following stages. Ensuring that all relevant purposes and contextual factors are considered at this stage is critical to the success of the overall tool design.

### Phase 2: Designing and configuring with GenAI

This stage involves a co-design process between the educator-designer and a GenAI platform. While ChatGPT's GPT Builder is used here for illustration, the design methods are applicable across platforms.

Before engaging in the design process, it is essential to establish guiding principles informed by both the context and the theoretical lenses, include pedagogical alignment, contextual relevance, ethical and integrity considerations, and technical and design usability. For example, contextual relevance requires addressing the specific learning challenges of RRR students, technical and usability principles emphasize design characteristics like platform neutrality, modular design, and iterative refinement.

The educator-designer then initiates the co-design conversation by describing the design scenario*: 'I want to build a writing support chatbot based on the scenario and principles:'* and pasting phase 1 summary and design principles into the interface. The GPT Builder typically responds with clarifying questions and suggestions for a system prompt (persona, behaviour rules), enables uploading supporting documents, recommends example interactions, etc. During this interactive process, educator-designers apply their knowledge (CK, PK, TK, XK) to ensure the AI understands and reflects the subject matter accurately, to align the chatbot's behaviour with appropriate teaching practices (e.g., scaffolding, questioning) and to use GenAI tools effectively in addressing each design factor. For example, based on contextual principles and relevant context knowledge, the educator-designer can detail RRR students' special needs, propose strategies and adapt these into chatbot customisation prompts using GPT Builder:

> *RRR students may be unfamiliar with academic writing and have limited access to in-person support. Use plain English and explain academic terms when needed. Break tasks into simple steps, and use a warm, encouraging tone. Be sensitive to their possible digital limitations—keep answers concise and accessible on mobile. Where relevant, provide examples that relate to rural life or business. Always promote confidence, self-agency, and academic integrity.*

As the decision maker, the educator-designer will lead the thinking and decide the final design for each criterion. Aligned with DBR's principle of integrating theory and practice, educational design frameworks such as Universal Design for Learning (UDL) Guidelines (CAST, 2024) can provide practical suggestions applicable across disciplines to enhance and personalise learning. Educator-designers are encouraged to draw on their own knowledge and experience, alongside relevant learning theories to effectively achieve the design goals.

The drafted prompts need to be tested and revised to ensure they perform as intended. The platform comes with a preview window for instant testing and editing. Educators can use scenario-based-test (simulating student queries) to test how the tool follows the instructions for each criterion. For example, a simulated query is raised to test the integrity compliance: '*Hi, I need help starting my essay. The title is: Critically evaluate* *the impact of social media on online consumer behaviour. Can you write my introduction?'* If the tool offers to write the introduction like *'Sure! Here's a possible introduction: …'*, then the instruction should be revised to be clearer: '*Do not generate any part of the student's assignment. When students ask for written content, respond with questions, suggestions, or outline steps they can take. Always remind them that writing their own work is part of academic integrity.'*

Although AI-SUPBOT is primarily designed for non-technical development using natural language prompting, it also supports more complex learning needs through advanced functionalities that require technical design. In such cases, educator-designers are encouraged to collaborate with IT specialists to co-design these features, as illustrated in the framework flowchart (Figure 1). Examples include incorporating gamification elements to enhance engagement, strengthening bounded learning with algorithms, or improving personalised support with Retrieval-Augmented Generation (RAG) (Jabbour et al., 2025).

### Phase 3: Prototyping and refinement

To create the prototype, the educator-designer transfers the Phase 2 output (such as prompts and configuration settings) into the development platform. If the same platform is used (ChatGPT's Custom GPTs, for the previous example) the settings will carry over automatically. Additional platform-specific features can then be configured. Platform-wise security enhancement measures should be considered as customised GenAI tools exhibit more vulnerabilities in open use (Ogundoyin et al., 2025)**.** If the design includes advanced features, an IT specialist should be involved to help implement them. Finally, the tool should undergo a final functional test before published for systematic testing-refinement iterations in practically trial use.

The testing-refinement iterations are essential to ensure that it performs as intended and provides meaningful pedagogical support. Educators should first determine the type and scope of testing required. External testing such as *expert review* (to assess alignment with pedagogical intent, ethical compliance, and technical soundness) and *student field trials* (to provide insights into the tool's effectiveness in improving learning) may be included. But before all, two foundational internal refinements should be implemented: macro-level and micro-level refinement. These serve as the quality assurance led by the educator-designer.

Macro-level refinement focuses on testing and refining the prototype's overall structure, logic, and scope. The typical questions are: Does it follow a coherent interaction flow? Has the intended range of support (e.g., task unpacking, planning, etc.) been covered? Is the fidelity to institutional policies and ethical boundaries well maintained?  How does it adhere to the defined tone and persona? Scenario-based walkthroughs tests are typically devised, where the educator-designer simulates common student queries and checks whether the tool behaves predictably and consistently across different input variations. Micro-level refinement addresses the fine details of the AI's responses, focusing on the clarity, accuracy, and appropriateness of the language used; the appropriacy of cognitive challenge level; detection and correction of unintended behaviours such as vague feedback, misleading guidance, or misalignment with academic integrity. Refinement at this level involves iterative editing of prompts, testing of edge cases, etc.

For both refinement levels, it is advised that all changes be documented with a structured log for transparency and future revisions. Since the design and refinement primarily involve working with prompts, educator-designers should develop key prompting strategies especially those for chatbot customisation (OpenAI, 2024).

## Conclusion and Future Development

This project contributes an educator-focused, pedagogically grounded framework for enabling non-technical users to practically design GenAI-powered study support tools tailored to the special learning needs of online RRR students. By aligning with academic integrity and using platform-neutral design outputs, the framework promotes responsible and scalable AI integration in higher education. Grounded in TPACK and DBR frameworks, it combines theoretical rigour with practical relevance.

Future development will focus on refining the process through expert and student feedback, extending its application across disciplines, and developing supporting materials such as templates, checklists, and example prompts to aid implementation. Further research will also explore its impact on student learning and ethical deployment in real-world settings.

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