

Applying Multiple AI Agents in One Course: A Case Study of the PGcert 404 Module

Academy of Future Education, Centre for Knowledge and Information

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1. Background

PGcert 404 ("Technology Enhanced Learning and Teaching") is an elective module within XJTLU's Postgraduate Certificate (PGcert) programme. Notably, the learners in PGcert 404 are themselves university educators, who must balance their studies with demanding teaching, research, and administrative responsibilities. The module aims to: develop university staff capacity to plan, design, implement, and evaluate Technology Enhanced Learning (TEL) strategies; enhance awareness of quality assurance in educational technology, including the implications of Generative AI; and encourage critical reflection on technology use in teaching, ensuring alignment with the Professional Standards Framework (PSF) 2023.

The assessment comprises: 1) Forum Posting and Feedback (50% weighting): learners submit a 1,000 – 1,500-word forum post discussing a pedagogical application of an educational technology, plus peer

feedback on at least two other posts; 2) Critical Reflective Summative Essay (50% weighting): a 1,500 – 2,000-word reflective essay evaluating TEL in practice with PSF alignment.

Despite detailed guidance via video lectures and exemplars, students consistently face challenges in: fully understanding assessment requirements, particularly connecting theory to practice; producing reflective writing that meaningfully links teaching experience to PSF; and applying generic technological recommendations to their specific contexts. These gaps indicate a disconnect between universal pedagogical principles and classroom adaptation.

2. Solutions

To address challenges and enhance learner experience, the module team deployed three specialized AI agents via Learning Mall and Coze (a no-code AI agent platform):

1. **Virtual Teaching Assistant (TA):** A generalist chatbot handling course queries (assessment criteria, deadlines, readings). Adopts Socratic dialogue—guiding students to construct their own answers through diagnostic and strategic questioning rather than direct solutions. Features a "Source of Truth" mechanism storing

accurate, unalterable core information (assessment details, PSF embedding guide, handbook links) in Q&A format to ensure precision and auto-generate resource links. Knowledge base includes course handbook, task sheets, FAQs, and TEC-VARIETY strategies.

2. **Virtual Instructional Designer (ID):** Assists educators in integrating technology into teaching plans. Students upload module descriptions/plans; the agent provides tailored TEL-enhanced suggestions. Built on authoritative ID theories (ADDIE, 4C/ID, Merrill's Principles, Gagné's Methods) to bridge theory-practice gaps. Document preparation protocols ensure clean, topic-segmented knowledge base entries for optimal retrieval.
3. **Virtual Feedback Provider:** Delivers formative feedback on draft submissions. Configured with DeepSeek-V3-0324 LLM, tightly aligned to PGcert 404 assessment standards and learning outcomes. Prompt engineering structures feedback across nine dimensions: word count compliance, critical reflection depth, alternative approaches, literature usage, PSF alignment, rationale for future actions, learning outcomes A/B demonstration, referencing standards, and summary guidance. Constraints ensure PGC404-specific, evidence-based feedback.

All agents operate on RAG framework with low temperature (<0.1) for deterministic, trustworthy outputs. Design rigor includes collaborative testing cycles and an iterative optimization process.

3. Outcomes and Benefits

Since implementation, the system recorded 294+ interactions with overwhelmingly positive textual feedback. Students praised the agents for clarifying assessment expectations and providing instant, time-saving feedback. Many found the virtual tutor powerful and expressed interest in adopting similar tools in their own course designs.

Student Testimonials:

- "The PGC404 virtual tutor is very powerful."
- "Integrating the AI tutor into Learning Mall is very convenient."
- "AI tutor is a noteworthy tool; perhaps I can incorporate it into my assignment design system."
- "The chatbot is practical and efficient in helping obtain targeted feedback."

Key Impact: Demonstrates AI's potential to resolve the "scale vs. personalization" contradiction in higher education—addressing large cohorts while providing targeted support. The multi-agent approach

offers a framework for "AI-enhanced, not AI-replaced" teaching, freeing educators from repetitive tasks to focus on higher-order reflective guidance and tackling Bloom's 2-sigma problem.

4. Replicability and Promotion Value

The model demonstrates high cross-disciplinary transferability:

Standardized Development Process: A four-stage methodology (prompt authoring → terminology standardization → collaborative testing → iterative optimization) enables rapid replication. Prompt authoring defines roles and scope; standardization ensures consistent language/tone across agents; collaborative testing involves peer evaluation from student perspectives; optimization refines prompts and knowledge base based on feedback.

Modular Architecture: The three-agent division model (administrative support × instructional design × formative feedback) suits any hybrid-assessment course. The Virtual TA handles 80%+ routine queries; the ID provides scaffolding for technology integration; the Feedback Provider is ideal for courses with explicit reflective writing rubrics.

Low Technical Barrier: Built on no-code platforms like Coze, deployable by faculty with basic training. RAG framework with low temperature settings ensures accuracy and consistency.

Strategic Alignment: Fully aligned with XJTLU's Education+AI Strategic Framework 2025-2028. Successfully spawned three specialized agents in the Language Centre's Year 1 EAP programme (Y1 EAP Module Guide, Online Lesson AI Assistant, Y1 EAP Resit Helper), validating adaptability across contexts.

This case provides an operational paradigm for "how AI can deliver personalized support at scale" in higher education, particularly suited for foundational courses (>100 students annually) or faculty development programmes.