Integrating AI Agent Construction and Evaluation into Undergraduate Lab Teaching: A SAT101 Case Study

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1. Background

SAT101 AI Application Design is a core Year 2 module offered by the School of Advanced Technology (SAT), enrolling over 900 students and emphasizing the development of practical AI application design skills. In the context of the rapid advancement of generative AI and AI agents, traditional teaching approaches—largely based on theoretical instruction or static laboratory exercises—have become insufficient to fully support students' understanding of key competencies such as AI system construction, knowledge retrieval, prompt design, and performance evaluation. Lab 4, "Build Up and Evaluate an AI Agent," was designed as the most comprehensive practical component of the module, aiming to allow students to experience the complete lifecycle of an AI agent within an authentic workflow. However, a purely code-based implementation (e.g. manually calculating evaluation metrics using Python) would impose high technical demands on Year 2 students and significantly

increase the complexity of classroom organization and technical support, potentially undermining learning experience and consistency across large cohorts. To address these challenges, the teaching team collaborated with Learning Mall to explore how appropriate platform-based tools could be introduced to transform AI agent construction and evaluation into a learning experience that is **operational, comprehensible, and assessable**, while maintaining pedagogical depth and academic rigor.

2. Solutions

This case adopts the **XIPU AI Agent Platform** as the core teaching support and redesigns Lab 4 as an end-to-end AI agent practice and evaluation task. The instructional design clearly differentiates between the learning focus on **conceptual understanding** and the complexity of **technical implementation**.

1) Dual-Approach Design and Pedagogical Decision-Making

During the preparation phase, the Learning Mall team designed two alternative lab approaches:

Python-based implementation

This approach focused on manually implementing evaluation metrics such as precision and recall. While offering substantial technical depth, it required significant programming skills and environment setup.

XIPU AI Agent Platform-based implementation

This approach guided students through knowledge base construction, agent configuration, prompt design, and evaluation via a graphical and workflow-oriented interface. No additional software installation was required, making it more suitable for large-scale undergraduate teaching.

After considering learning objectives, classroom feasibility, and student experience, the module leader ultimately selected the **XIPU AI Agent Platform** approach to ensure that teaching objectives could be reliably achieved in real classroom settings.

2) Task Design Centered on a Realistic AI Agent Workflow

The lab activities were structured around the complete lifecycle of an AI agent, including:

- Constructing and organizing a structured Knowledge Base
- Configuring the AI agent (model parameters, retrieval methods, input/output logic)
- Designing system prompts and safe response strategies
- Evaluating the agent using a test dataset and interpreting key metrics such as relevance, precision, and recall

To reduce unnecessary technical barriers while preserving appropriate learning challenge, the teaching team provided a **Harry Potter–themed**

sample knowledge base, a test dataset, and step-by-step task guidance. This allowed students to focus on understanding AI agent design principles and evaluation reasoning rather than low-level technical details.

3. Outcomes and Benefits

By deeply integrating the AI agent platform into Lab 4 teaching, this case achieved significant outcomes:

- **High attainment of learning objectives**: Students were able to independently complete knowledge base construction, agent configuration, and evaluation tasks, and clearly understand how different retrieval strategies and prompt designs affect outcomes.
- **Effective integration of theory and practice**: Abstract AI concepts—such as retrieval augmentation and performance evaluation—were transformed into observable and comparable practical results, enhancing conceptual understanding.
- **Improved engagement and learning investment**: Students demonstrated strong participation during prompt design and evaluation activities, developing intuitive understanding through iterative experimentation.
- **Enhanced visibility of Learning Mall's teaching support role**: The lab demonstrated that Learning Mall functions not only as a technical

support unit but also as a **co-creation partner in teaching**, directly contributing to course design and delivery.

Overall, the lab successfully realized **teachable, learnable, and assessable AI engineering practice competencies** under large-scale teaching conditions.

4. Replicability and Promotion Value

This case demonstrates strong replicability and can be applied to a range of teaching contexts, including:

- Laboratory or practice-based courses in AI, data science, and computing disciplines
- AI literacy and application courses for students without a purely technical background
- Interdisciplinary courses emphasizing understanding of agents, RAG workflows, and evaluation metrics

By positioning the platform as an **"engineering workflow support tool"** rather than a substitute for student thinking, this model offers a practical framework for balancing technical complexity and learning effectiveness in AI education.

5. Next Steps

Future development may include:

- Introducing student reflections or evaluation logs on AI agent design to strengthen metacognitive and critical thinking skills
- Developing group-based versions of the lab to simulate real-world AI team collaboration
- Extending the model to higher-level or cross-school courses to form a coherent and progressive AI practice curriculum

This case provides a solid foundation for deeper AI teaching collaboration between Learning Mall and academic units.