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Enhancing Sustainability in Academic Guidance: Develop an AI-Driven Agent for Education 5.0

Yiting Qiu[1,2*], Munir Hayet Khan[2], Shuqing Zhu[1], SiYuan Chen[3], Choonkit Chan[2]

[1]Zhejiang Technical Institute of Economics, Hangzhou 310018, Zhejiang Province, China.
[2]Faculty of Engineering and Quantity Surveying, INTI International University, Persiaran Perdana BBN, 71800 Nilai, Negeri Sembilan, Malaysia.
[3]ZheJiangGongShang University, Hangzhou 310018, Zhejiang Province, China.

***Email:** barbaraqiu@DingTalk.com

Abstract

This study aims to develop a Multimodal Artificial Intelligence (AI) Agent named "Academic Quick Guide", specifically designed for academic guidance in the Education 5.0 era. By utilizing generative AI techniques and following Design Science Research Methodology (DSRM) processes, the research seeks to create a user-centric AI Agent that streamlines education management and improves academic advisory efficiency. Incorporating advanced features such as Knowledge Databases and Prompt Engineering, this AI Agent is expected to enhance user experience, facilitate decision-making, and improve academic outcomes sustainably. Serving as a 24*7 self-service academic advisor, this AI Agent will be available around the clock to support student' academic needs in a timely and effective manner. Leveraging the Qwen Large Language Model (LLM) and the concept of "Model as a Service" (MaaS), this AI Agent will promote sustainability in educational environments by optimizing resource utilization, enriching learning experiences, and providing personalized academic support.

Keywords

Multimodal AI Agent, Qwen LLM, Model as a Service, User experience

Introduction

In recent years, there has been an expansion in enrollment across higher education, resulting in a growing number of university and college students in China. The digital-native Generation Z not only possesses high digital proficiency but also expresses a strong desire for personalized academic support and management. Concurrently, the post-pandemic era has compelled both public and private education institutions to seek more efficient and cost-effective operational strategies, often necessitating workforce reductions (Uzbekistan et al., 2024; Li et al., 2024; Mikalef et al., 2023). This trend aligns with broader initiatives aimed at creating green

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campuses and accelerating digital transformation, with a particular focus on leveraging artificial intelligence(AI) to drive high-quality educational development and foster new forms of academic productivity (Xi et al., 2023). These efforts are integral to the vision of Education 5.0, which emphasizes the integration of advanced technologies to create more intelligent, responsive, and sustainable educational environments (Qiu et al., 2023). Meanwhile, the developed multimodal AI Agent could fully harness the AI's capabilities, making it more intelligent and human-like in task execution, thereby improving operational efficiency and service quality within enterprises (Gu & Yang, 2022; Tse & Pun, 2024). The development outcome is expected to achieve the following equation: AI Agent in the era of large models = LLM * (Planning + Memory + Tools + Action) (Xi et al., 2023).

Methodology

Design Science Research Methodology (DSRM), introduced by Peffers et al. in 2007, offers a structured framework for information systems (IS) research, focusing on the development and evaluation of IT artefacts and solutions (Ding et al., 2023; Golovianko et al., 2023; Haryanti et al., 2022). It comprises six steps: 1) problem identification and motivation, 2) definition of solution objectives, 3) design and development, 4) demonstration, 5) evaluation, and 6) communication (Haryanti et al., 2022). Applying DSRM to AI Agent creation reflects its systematic nature, aiding in problem identification, goal setting, solution design, functionality testing, effectiveness evaluation, and result communication, thereby fostering organized innovation, efficient resource utilization, and lean development practices.

Qwen, a highly advanced language model, excels in various natural language processing tasks, making it an ideal tool for developing AI Agents. Users can customize and create AI Agents with robust conversational abilities, deep learning, and reasoning capabilities using Qwen (Bai, Bai, Chu, et al., 2023). Its flexibility and powerful processing capacity make Qwen suitable for multiple applications, including automated customer service, content generation, and data analysis. Developers can efficiently build intelligent AI solutions with Qwen, enhancing productivity and user experience (Bai, Bai, Chu, et al., 2023; Bai, Bai, Yang, et al., 2023). Configuring AI Agents on the DingTalk platform offers significant advantages, such as the ability to set roles and configure specific skills tailored to various application scenarios (Tse & Pun, 2024; Gu & Yang, 2022). Moreover, DingTalk provides extensive prompt engineering potential, enabling developers to finely tune prompts and response logic (Tse & Pun, 2024; Wang et al., 2023).

Problem Statement and Motivation:

In higher education institutions, timely and effective academic support is a significant challenge due to information overload and gaps. Traditional Office Automation (OA) systems fail to provide instant, round-the-clock responses to student queries, while platforms like WeChat and QQ consume substantial storage and communication time. These inefficiencies hinder sustainable education development and green campus initiatives. Existing software

applications for academic management lack real-time, automated responses based on institutional knowledge. Thus, a pressing need exists for an AI solution tailored to academic contexts, capable of addressing these challenges with precision and efficiency.

Objective Definition:

The implementation of an AI Agent utilizing the advanced capabilities of the Qwen large-scale model holds significant potential to enhance the efficiency and quality of educational management systems. By providing a more tailored academic advisory experience for students, the AI Agent can address their queries in real time, reducing the burden on educational administrators and allowing them to focus on more creative and high-value tasks. Additionally, the AI Agent can help mitigate the pressures associated with staff reductions, ensuring that the educational institution operates smoothly and effectively.

By focusing on these objectives, we aim to create a more efficient and responsive educational management environment.

Design and Development

Step 1: Initialization on DingTalk.

Invoke the Qwen large language model to create an AI Agent on the DingTalk platform. This involves accessing the DingTalk platform and utilizing the advanced features of the Qwen model to build an AI Agent specifically designed to meet academic advisory needs.

Step 2: Customizing the Role of AI Agent and Prompts.

The AI Agent's roles and specific prompts are customized to facilitate effective interactions with users. Named "Academic Quick Guide," this AI Agent is equipped with specialized prompts designed to address student queries efficiently. The AI role settings and prompt engineering focus on developing an AI Academic Advisor Agent using the Qwen large model on the DingTalk platform, making it accessible to all organizational members. This "Academic Quick Guide" Agent is designed to deliver timely and accurate academic advice by leveraging a comprehensive knowledge base and prompt engineering techniques. Additionally, it is configured to operate in a legally and ethically compliant manner, aligning with the educational institution's goals.

Step 3: Setting Up AI Skills and Knowledge Base.

Equip the AI Agent with the essential skills and Knowledge Base to provide academic suggestions or assist users in resolving their academic challenges. The AI Agent's skills were configured, including self-introduction of the AI agent before interaction, intelligent creation, smart to-do lists, accessing the school website, showed in Figure 1.

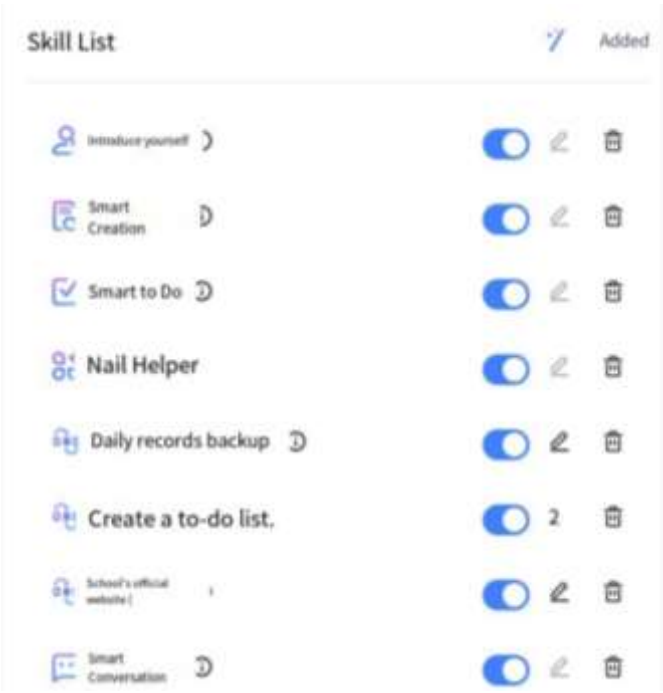

Figure 1. The configuration of skills of "Academic Quick Guide"

The Knowledge Base includes official academic guidance documents, academic norms, and so forth, as shown in Figure 2. This facilitates precise responses to user inquiries based on shared data from educational institutions, while also conserving computational power for large language models.

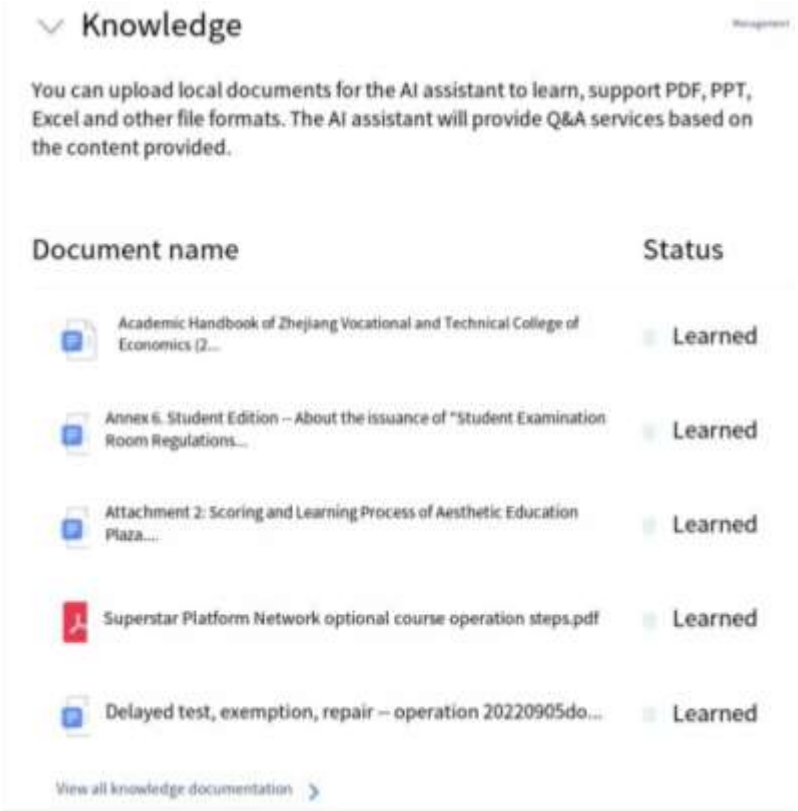

Figure 2. The Knowledge Base of "Academic Quick Guide"

Step 4: Set up welcome page

Set up some chat examples related to academic guidance for the "Academic Quick Guide" to help new users start smoothly, as Figure 3 shows.

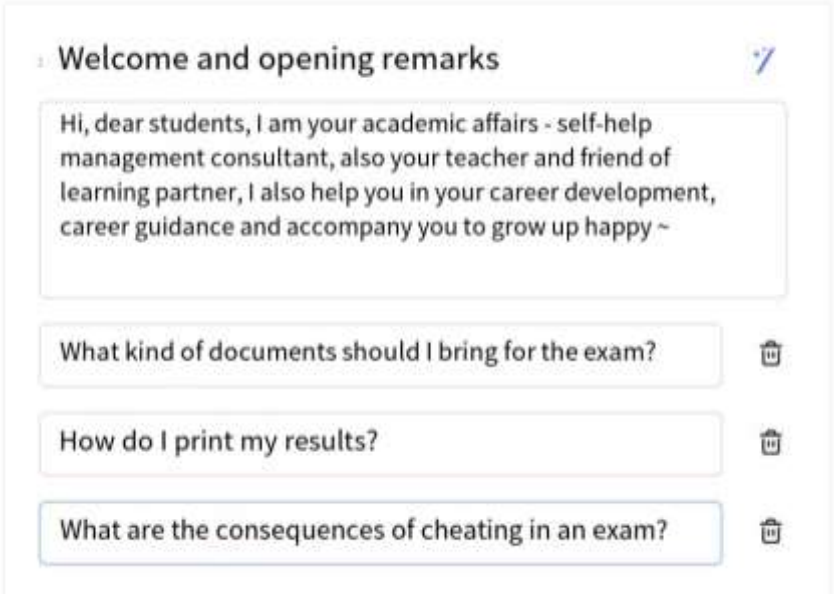

Figure 3. Welcome page of "Academic Quick Guide"

Step 5: Test the "Academic Quick Guide" AI Agent

Upon completion of the creation process, the AI Agent was carefully tested and evaluated to ensure that its functionality and user experience aligned with the anticipated standards.

Step 6: DingTalk Review & Release

Submit the "Academic Quick Guide" AI Agent for evaluation by DingTalk officials. Following approval, it can be released in the AI market for public access. This step is essential for expanding its user base and ensuring adherence to platform regulations (Qiu et al., 2024).

Demonstration

According to DSRM rule, it requires a demonstration to show how the solution works. Therefore, the "Academic Quick Guide" was demonstrated during the lecture to encourage more students and teachers to use it. This allowed stakeholders to visually grasp the practical applications and effectiveness of the solution.

Evaluation

Following the demonstration, we assessed the AI Agent's performance by gathering user feedback, analyzing its functionality, and making iterative improvements. Consequently, the solution was optimized to be highly functional, effective, and efficient on DingTalk.

Communication and Conveying Research Findings

Currently, our team strives to disseminate our research findings through papers, conference

presentations, and publications. This approach ensures that the outcomes gain wide recognition and establish a foundation for further research and development.

Results and Discussion

Through a series of specific design and development steps, the "Academic Quick Guide" tailored for the educational management system was successfully created. The AI Agent has successfully passed the official DingTalk review and is now available on the official agent marketplace. As a multimodal AI Agent, it supports voice, text, and document input. It can provide timely and effective responses to users in various formats, such as text, code, and images, at any time and from anywhere, as long as there is internet access. The Agent not only leverages the capabilities of the Qwen general large model to answer general knowledge questions and provide programming assistance, but it can also address specific academic inquiries based on its knowledge base. Below are examples of human-computer interactions. For demonstration purposes, some examples have been translated from Chinese to English.

Figure 4 shows that when a user asks the "Academic Quick Guide" via voice which software is more suitable for learning data analysis—Python or MATLAB? The "Academic Quick Guide" quickly and thoroughly analyzes the advantages and disadvantages of both options along with their applicability, providing general guidance. When the user follows up with questions about how to use Python for data processing, the AI Agent promptly provides an answer that includes code and detailed explanations. This significantly enhances the students' self-learning experience and efficiency in learning.

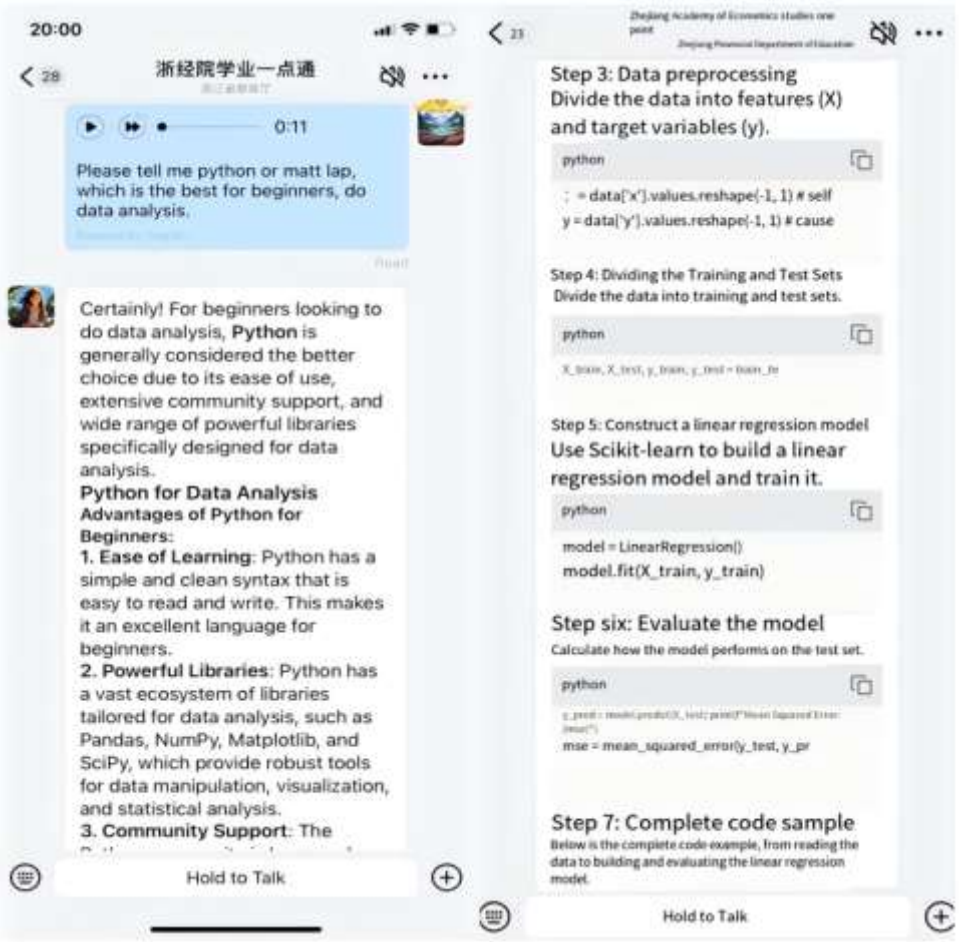

Figure 4. Talk with "Academic Quick Guide" how to learn data analysis

Figure 5 shows a user's question: "What identification do I need to bring for the exam?" The "Academic Quick Guide" rapidly accesses its knowledge base and promptly provides an accurate response to the user.

Consequently, the AI Agent serves as a thoughtful, intelligent, and personalized academic consulting assistant for students. Furthermore, based on our prompt engineering setup, this AI Agent is designed to provide emotional support; it consistently encourages users rather than display annoyance.

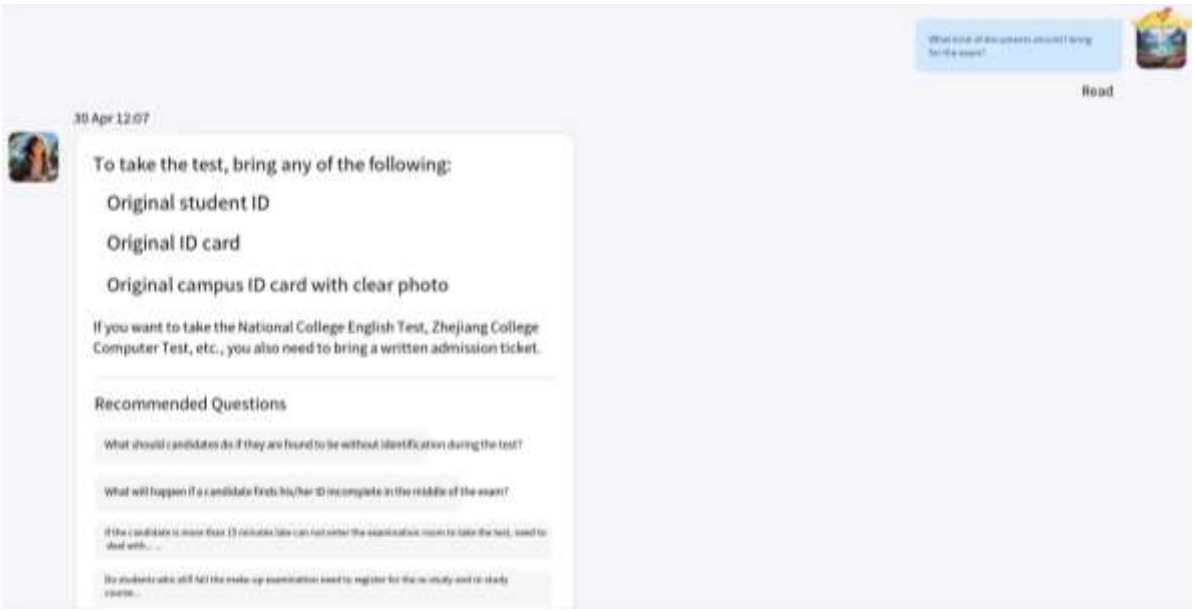

Figure 5. Talk with "Academic Quick Guide" specific academic question

Ultimately, this research highlights three innovative aspects of the AI Agent, which is built on the Multimodal Large Language Model and incorporates an internal knowledge base specific to the organization. First, the "Academic Quick Guide" AI Agent establishes a comprehensive internal knowledge base that optimizes the use of digital assets, minimizes waste, and revitalizes dormant resources for efficient information access. Second, by integrating the Qwen large language model into the digital collaboration platform, the AI Agent significantly improves language processing and analytic, enhancing automated responses and interactions for students, teachers, and administrators. Finally, the development of a personalized AI Agent customizes support to meet individual needs and workflows within the organization, ensuring timely assistance and tailored interactions. This leads to increased productivity, engagement, and user satisfaction, ultimately boosting overall operational efficiency. Furthermore, these innovations assist the development of a green campus and promote sustainable development (Qiu et al., 2023, 2024).

Conclusion

This study effectively addresses the pressing need for efficient and personalized academic support in higher education by developing an "Academic Quick Guide" AI Agent that leverages the advanced capabilities of the Qwen large-scale model, integrated within the DingTalk digital platform. By incorporating a comprehensive internal knowledge base, the AI Agent offers real-time, automated responses tailored to both students and faculty, compensating for the inadequacies of traditional office automation systems and popular social platforms (Li et al., 2024; Xi et al., 2023). Adhering to the principles of Design Science Research Methodology (DSRM), the implementation of this AI solution enhances operational efficiency, allowing educational administrators to focus on high-value tasks, and sets a benchmark for AI deployment in academic settings (Haryanti et al., 2022). This innovation not only fills a

significant research gap but also aligns with broader initiatives aimed at accelerating digital transformation and promoting sustainable, green campuses, which have been argued as spillover effects of AI technology (Qiu et al., 2023). Ultimately, it supports the vision of Education 5.0 by fostering a more intelligent, responsive, and sustainable educational environment.

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