### Research on Integrating AI Research Projects into Teaching to Enhance Students' Innovation and Practical Abilities

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Abstract: Higher education institutions play a dual role as centers of teaching and scientific research. Integrating research into teaching is essential for enhancing the quality of university education, as it enriches course content, updates knowledge structures, and improves teaching outcomes. This paper presents a reform initiative that strategically selects AI research projects aligned with course objectives to bridge theoretical knowledge with practical application. By focusing on real-world problems, students are engaged in meaningful research experiences that foster their ability to solve complex issues. the integration of research into teaching materials, combined with student participation in academic competitions and course projects, enhances both academic and practical skills. Additionally, this approach improves the quality of graduation theses and encourages undergraduates to contribute to academic publications. The proposed reform measures offer a comprehensive model for teaching. integrating research and preparing students for the evolving demands of the field of artificial intelligence.

Keywords: Scientific Research Promotes Teaching; Competitions and Courses; Innovation and Practice; Higher Education.

### 1. Introduction

Higher education institutions serve as both centers of teaching and scientific research. Teaching is the core task of universities, while scientific research fuels the vitality of universities and the source of new knowledge. Integrating research into teaching is a crucial approach to enhance the quality of university education. Scientific research can enrich the depth and breadth of teaching, update teachers' knowledge structures, and improve teaching outcomes. Teachers who continually engage in scientific research can expand their disciplinary knowledge and elevate their teaching quality. Incorporating new knowledge and research findings into teaching materials can update and enrich the content, ensuring that it keeps pace with advancements.

Research activities keep teachers sensitive to the latest developments in their fields, enhancing the depth and breadth of teaching. By integrating research problems, analytical methods, and problem-solving approaches into teaching, the classroom becomes more engaging and effective. This practice bridges theoretical knowledge with practical applications, making abstract concepts more tangible. Teachers can use their research experiences to bring knowledge to life, cultivating creative and forward-thinking talents.

The application of research to teaching has vast potential. Combining research integration with student innovation and entrepreneurship competitions can efficiently enhance students' abilities to solve practical problems and integrate theory with practice. Integrating research with graduation theses can improve the quality of these papers. Student theses derived from faculty research projects can significantly advance the progress and quality of student papers. Additionally, researchdriven teaching encourages undergraduate papers, participation in academic with outstanding students potentially publishing their research. This approach also supports the selection of provincial and university-level excellent graduation theses.

### 2. Analysis of the Current Research Status

Research on promoting teaching through scientific research begins with addressing the relationship between teaching and research, a

challenge faced by common modern universities, especially modern research universities. Burton Clark posits, "There is no issue more fundamental in the modern higher education system than the relationship between research and teaching" [1]. Historically, the association between research and universities marks the starting point of discussions on their relationship. Since the 1960s and 1970s, research on the relationship between teaching research has gradually become a and specialized field, evolving into a classic topic in higher education research.

Braxton suggests that the roles of teaching and research are similar, involving shared values (such as rationality), and thus, they should be complementary [2]. the roles of academics as teachers and researchers are symbiotic [3], described as a "holy alliance" [4] or a "marital relationship" [5]. the reason for this complementarity lies in the fact that research forms the foundation of teaching content, and the teaching process requires scholars to clarify the specific landscape of their research specialties [6-7]. This complementary or mutually reinforcing relationship represents the ideal relationship between teaching and research.

Enhancing scientific and technological innovation capabilities and establishing an innovative nation are essential paths to rejuvenating China and are the shared responsibilities of higher education institutions, research institutions, and professional technical Teaching and personnel. research are integrated, and their interaction collectively constructs the educational environment of higher education institutions, with the fundamental goal of cultivating high-quality innovative talents. Research is a crucial means of improving teaching quality and a breakthrough point for building a high-level faculty team. Teaching imparts knowledge, develops and while research innovates knowledge. Only through research can

teachers keep abreast of domestic and international trends, reflect new scientific achievements in teaching, enhance academic standards, and promote faculty development, thereby improving teaching quality. Research levels are key indicators of an institution's academic status and educational quality. the educational quality of universities is largely measured by their research innovation levels. Research benefits campus cultural construction. fostering an academic atmosphere conducive academic freedom, democracy, unity, to pragmatism, and innovation. It strengthens promotes interdisciplinary integration, academic prosperity and innovation, and creates a positive campus culture for cultivating high-quality talents [8-11]. Research is a driving force for improving teaching quality. Promoting teaching through research is an important means of enhancing university teaching quality. Higher education institutions should emphasize research work, integrating research and teaching organically. By promoting teaching through research, they can deepen teaching reforms, optimize course systems, update teaching content, and improve the quality of talent cultivation, thereby enhancing students' innovation and entrepreneurship capabilities. University teachers must engage in both teaching and research, effectively combining the two to improve teaching quality and research standards. Exploring the intrinsic relationship between research and teaching and revealing the objective laws and pathways of promoting teaching through research are of great significance for comprehensively improving teaching quality and deepening educational reforms in higher education [12-13].

### 3. Reform Measures

The overall schematic diagram of the research approaches and methods adopted in this paper is shown in **Figure 1**.



Figure 1. Research Approaches and Methods

### 3.1 Selecting Research Projects Aligned with Course Objectives

This study meticulously selects AI research projects that align with the actual conditions of AI courses and the existing syllabus. For instance, in AI courses like "Pattern Recognition" and "Digital Image Processing, " a research project on "gait recognition" can be selected. A comprehensive gait recognition includes image preprocessing, project pedestrian detection, semantic segmentation, binary contouring, gait cycle detection, feature extraction, and classification model design. Image preprocessing and pedestrian detection align closely with the syllabus of Digital Image Processing, focusing on fundamental image processing tasks necessary for subsequent recognition. On the other hand, feature extraction and classification align well with the Pattern Recognition syllabus, focusing on core feature extraction content like and classification model learning.

After selecting suitable research projects, it is essential to refine and design research cases, forming course projects. This involves seamlessly integrating necessary knowledge points into the syllabus and curriculum. In the Digital Image Processing course, students are provided with implementations of gait feature extraction and recognition to focus on learning related to image processing. In the Pattern Recognition course, image preprocessing implementations are provided to allow students to concentrate on core tasks like feature extraction and recognition.

Consideration of students' experimental resources is vital. Existing teaching and laboratory conditions should be fully utilized, supplemented by external resources to meet innovative needs. This involves updating and supplementing teaching materials, correcting outdated views, and incorporating new viewpoints and knowledge into teaching. For example, deep learning, a popular method in AI, requires the use of both shallow multilayer perceptrons for quick CPU-based experiments and deeper convolutional neural networks for advanced model methods. the course project includes a regression networkbased gait cycle detection step for practical learning. For deep neural networks requiring significant computing power, collaboration with companies like Huawei and Baidu can provide cloud resources, enabling highdemand experiments. This also promotes domestic AI development platforms like Huawei's ModelArts and Baidu's PaddlePaddle.

## **3.2 Identifying Real Problems from Projects and Cutting-Edge Papers**

Engaging students in real gait recognition projects can spark their interest and cultivate their ability to identify real research problems. For instance, analyzing the challenges and pain points of practical applications, such as the differences in data distribution between different viewing angles in gait recognition, encourages students to solve real-world problems.

Promoting the habit of reading cutting-edge academic papers, especially from top journals and conferences, helps students identify current research hotspots and key issues. By reading about 100 frontier papers, students can grasp the focal points of current research. Detailed reading of selected papers enhances their understanding of methods and models, providing a foundation for further exploration and problem-solving.

# **3.3 Enhancing Academic and Innovative Practical Abilities through Competitions and Course Projects**

Students are guided to summarize their research motivation and findings, describe their models, record experimental results, and analyze these results in a scientific format. These project reports, evaluated as part of the course grade, may be submitted to academic journals, encouraging undergraduates to publish their work. This process fosters academic and research skills while emphasizing the importance of high-quality graduation theses.

Graduation theses involve comprehensive processes like data collection, literature review, and applying knowledge to research and writing. Teachers should integrate student theses with their research, offering targeted guidance on problem identification, analysis, solution development, and academic writing. Encouraging exceptional students to participate in research projects benefits both teaching and research.

Competitions drive and guide student interest, promoting a unique education model that combines competitions with courses. Encouraging participation in competitions like the Internet+ and AI Innovation Contest integrates multiple disciplines, enhancing students' innovation and practical abilities. Adjusting the course syllabus to include necessary competition knowledge ensures students can easily participate in competitions, fostering their innovative and practical skills through experiential learning.

### 4. Conclusion

Integrating AI research projects into teaching not only enhances teaching quality but also cultivates students' innovation and practical abilities, preparing them for future scientific endeavors and practical applications. We have successfully demonstrated the value of aligning research projects with course objectives in AI education, effectively bridging theory and practice. By focusing on real-world problems and engaging students with cuttingedge research, we have enhanced their ability to contribute meaningfully to the field. the integration of academic competitions and course projects has further developed students' practical and academic skills, preparing them for future challenges. These reforms provide a model for integrating research and teaching, offering a comprehensive and forwardthinking approach to AI education.

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