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Developing an Artificial Intelligence Applications Course for Liberal Arts Students in Vocational Universities: A Case Study of Shenzhen Polytechnic University

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Abstract

With the rapid advancement of artificial intelligence (AI), it has become a driving force for innovation across various sectors. AI not only impacts technological domains but also brings new opportunities and challenges to industries such as finance, healthcare, and education. Recognizing the challenges faced by liberal arts students in AI education, Shenzhen Polytechnic University developed and launched the course "Artificial Intelligence Applications for Liberal Arts" in 2022. This interdisciplinary course is structured around four thematic modules designed to enhance students' understanding and applications of AI technologies. Moreover, the course integrates popular AI platforms and tools to strengthen students' hands-on experience, aligning with the Applications-oriented design principle. Each project incorporates a question-based, progressive learning pathway, guiding students step by step from foundational understanding to practical AI applications. Over four semesters, the course has significantly enhanced students' understanding of AI technologies and cultivated interdisciplinary and critical thinking abilities. Students completed high-quality projects integrating AI with their respective fields and achieved success in various competitions, receiving numerous awards. The design and implementation of this course provide valuable insights for future AI course development in liberal arts education. It demonstrates that, with appropriate content and teaching strategies, liberal arts students can effectively acquire and apply AI skills, enhancing their competitiveness in an AI-driven society.

Keywords

Artificial Intelligence Applications, Liberal Arts, Interdisciplinary.

1. Introduction

With the advancement of artificial intelligence (AI), it has become a driving force for innovation. AI impacts not only technological domains but also brings new opportunities and challenges across various industries such as finance, healthcare, and education[1-3]. Currently, information technologies like big data and large language models are reshaping the skills landscape, creating a demand for graduates who are skilled not only in their core disciplines but also in understanding and applying AI technology.

In this evolving context, there is an increasing demand for innovative, interdisciplinary approaches to AI courses within liberal arts programs at vocational universities[4-5]. By incorporating AI into liberal arts education, students could gain broader perspectives and technical skills that strengthen their career readiness, allowing them to navigate and leverage digital tools[6]. For instance, students can analyze complex textual data and generate content efficiently using large language models. This interdisciplinary integration not only enriches

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liberal arts students' knowledge base but also equips them to adapt and thrive in an AI-driven digital society.

However, conducting an AI course for liberal arts students presents considerable challenges since students in these majors typically have backgrounds rooted in the humanities and social sciences and are accustomed to learning concrete and visual knowledge[6-7]. In contrast, AI-related concepts such as machine learning, deep learning, computer vision, and natural language processing are generally abstract and have limited connections to the liberal arts. This disciplinary gap presents significant comprehension challenges for liberal arts students attempting to understand and apply AI. Additionally, many students have limited experience in science from high school, leading them to perceive technical related courses as "difficult." This perception often results in their low self-efficacy[8], causing apprehension and reduced confidence in their ability to succeed[9].

Furthermore, the currently popular AI course frameworks are largely designed for students in science and engineering, with a major focus on algorithms and programming alongside some applications scenarios. These frameworks, however, do not align well with the diverse applications and innovation needs of liberal arts students at vocational universities because they emphasize technical depth over practical applicability in non-technical fields. AI courses for these students should place greater emphasis on practical applications skills while introducing essential knowledge and principles, ensuring they can leverage AI tools effectively in real-world scenarios.

Therefore, there is an urgent need to design an AI course tailored for liberal arts students at vocational universities. Such a course should address two main challenges: Firstly, it should focus primarily on the practical applications of AI rather than theoretical knowledge. Secondly, the course design should align with the students' existing knowledge structures and aim to build their confidence, thereby supporting them in successfully completing the course.

To address these challenges, Shenzhen Polytechnic University developed and launched the course "Artificial Intelligence Applications for Liberal Arts" in 2022. This interdisciplinary course is structured around four thematic modules designed to enhance liberal arts students' understanding and applications of AI technologies. In particular, the module on discriminative AI applications employs First Principles Thinking to simplify abstract concepts by relating them to human. This analogy-based approach lowers learning barriers and boosts students' confidence by making complex AI concepts more accessible. Furthermore, the course integrates popular AI platforms and tools to strengthen students' hands-on experience, aligning with the Applications-oriented design principle. Each project incorporates a question-based, progressive learning pathway, guiding students step by step from foundational understanding to practical AI applications. This method not only reinforces theoretical knowledge but also enhances self-efficacy by allowing students to witness their own progress. By combining these strategies, the course effectively equips liberal arts students with the skills needed to navigate an AI-driven society, as detailed in the subsequent sections of this paper.

2. Course Design and Development

This section presents the design and development of the AI Applications course tailored for liberal arts students at Shenzhen Polytechnic University. It details the course objectives, the key principles guiding its design, and the framework and content that structure the course.

2.1. Course Objectives

The AI Applications course is an interdisciplinary program designed specifically for liberal arts students. It aims to strengthen their ability to apply AI technologies and AI-assisted skills in the

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age of artificial intelligence. To achieve these objectives, the course focuses on enabling students to acquire:

Basic Understanding of AI Concepts: Foundational knowledge of AI principles and concepts relevant to the modern AI era.

Essential Technical Skills for AI Applications: Proficiency in practical AI tools and platforms necessary for real-world applications.

Integration Skills of AI with Field-Specific Requirements: The ability to combine AI knowledge with domain-specific needs, enhancing the relevance to each student's future profession.

2.2. Key Design Principles

To achieve the learning objectives, this course adheres to the principles of "**Cutting-edge Focus, Applications-Oriented, and Comprehensiveness**," tailored to meet the learning needs of liberal arts students.

2.2.1. Cutting-edge Focus

AI technologies are advancing rapidly, with new applications and innovations emerging continuously. Without a focus on cutting-edge developments, course content risks becoming outdated and may not adequately prepare students for future demands. By equipping students with the latest AI skills and introducing them to innovative techniques and scenarios, the course broadens their career opportunities and helps them stand out in both employment and further education contexts. Learning about cutting-edge technologies fosters a problem-solving mindset essential for thriving in a rapidly changing technological landscape.

2.2.2. Applications-Oriented

Vocational education aims to help students prepare for specific careers, and AI applications are increasingly in demand across various fields. Employers in technical and business fields prioritize graduates who can apply skills to solve real-world challenges immediately. By focusing on practical tasks and scenarios, the course builds students' competencies in widely used AI tools and methods. Moreover, when students recognize the relevance of AI to practicaland career contexts, they tend to be more engaged and motivated. Incorporating hands-on AI tasks enables students to build confidence in their abilities, gain a sense of accomplishment, and see clear connections between their education and career opportunities, thereby enhancing their overall learning outcomes.

2.2.3. Comprehensiveness

AI is applied across diverse scenarios, including healthcare, finance, logistics, and media. Comprehensive tasks cover a wide range of AI applications, allowing students to explore and understand multiple contexts. Simultaneously, students learn to integrate AI concepts with fields such as data analysis, ethics, and communication. This integration empowers students to apply AI responsibly and effectively, developing essential skills for tackling complex, real world challenges where interdisciplinary collaboration is highly valued.

2.3. Course Framework and Content

Figure 1 illustrates the framework of the AI Applications course. The course is structured from both technological and applications perspectives to provide a comprehensive understanding of AI technologies and their practical applications across diverse data types, media, and industries.

Students begin by building a foundational understanding of AI, including its definition, core components, and significance in the real world. They then explore the two primary categories of AI: Discriminative AI and Generative AI. Discriminative AI is further categorized based on information type, encompassing: machine learning for data analysis, computer vision for image processing, natural language processing for text analysis, speech processing for audio content, and robotics for control and automation tasks. Additionally, generative AI focuses on

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technologies that can generate new content, with large language models being a prominent example.

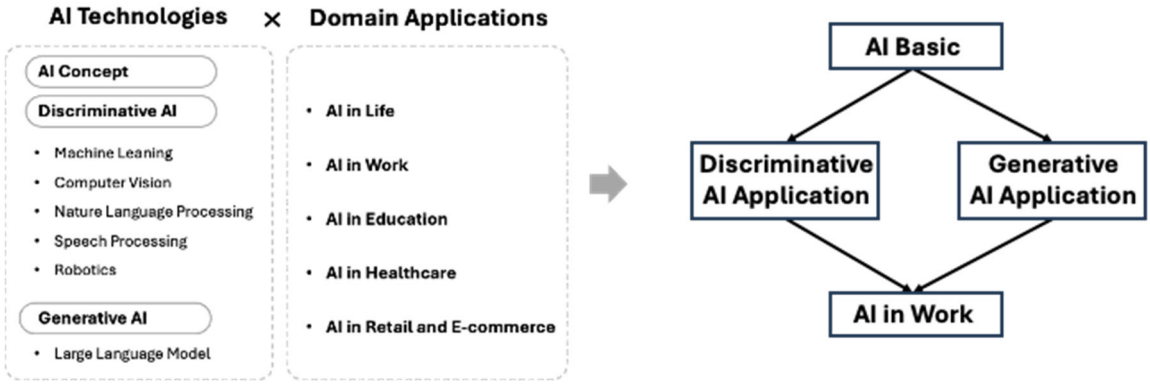

Figure 1. The Framework of the AI Applications Course for Liberal Arts

From an applications domain perspective, AI applications are explored across various fields, including: everyday life and work, education, healthcare, retail, and e-commerce. By integrating both technological and applications perspectives, the course provides students with a holistic framework for understanding AI. Therefore, this course includes the following four thematic modules.

2.3.1. Module1: AI Basics

This module covers fundamental computer principles, core elements of AI, its societal impact, and ethical considerations. By the end of this AI Basics module, students will be able to explain fundamental AI concepts and principles, identify and describe core AI elements, analyze the role of AI in daily life, discuss the ethical implications of AI in society, and critically evaluate related ethical issues.

These module provides a well-rounded foundation that bridges technical knowledge with a broader understanding of AI's role in society, enhancing both comprehension and critical thinking.

2.3.2. Module 2: Discriminative AI Applications

This module is presented through five thematic projects using human functions as analogies: “How AI Thinks,” “How AI Understands Images,” “How AI Reads Text,” “How AI Listens and Speaks,” and “How AI Acts.” Each project integrates hands-on practice with mainstream AI platforms, enabling students to grasp underlying principles while mastering real-world applications in both daily and professional settings. By the end of this module, students will understand discriminative AI and its key technologies. They will be able to conceptualize and explain major AI concepts in their own words, such as computer vision, natural language processing, and more. Additionally, they will be familiar with mainstream AI platforms and tools and have the ability to select appropriate tools or platforms for tasks like data analysis, customized image recognition, effective text analysis, and speech recognition.

This module provides a strong foundation for the flexible applications of AI technology in the future.

2.3.3. Module 3: Generative AI Applications

This module mainly focus on advanced generative AI technologies, covering the fundamentals of generative AI, large language models, prompt-writing techniques, and their applications in content generation, data analysis, and other areas. By the end of this module, students will be able to understand the difference between discriminative and generative AI, comprehend the principles and functions of large language models and their role in AI advancements, develop

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effective prompt-writing techniques, utilize generative AI technologies for content generation, and evaluate the ethical considerations of using generative AI in various contexts.

The goal of this module is to enhance students' ability to use large language models effectively to solve problems in complex scenarios.

2.3.4. Module 4: AI in Work

This module extends AI applications into smart office environments, covering efficient skills for using office software such as Word, Excel, and PowerPoint. Additionlly, it demonstrates how to leverage AI technology to optimize document content, analyze data, and create presentations. By the end of this "AI in Work" module, students will be able to recognize AI's impact on smart office environments and its role in shaping the future workplace; leverage AI technologies to optimize document content, including proofreading and formatting; perform data analysis with AI tools to extract insights for decision-making; and create engaging presentations using AI features that enhance design and content delivery.

Through this module, students can effectively apply AI technologies in routine office tasks, enhancing productivity and ultimately boosting their competitiveness in the vocational job market.

3. Teaching and Learning Approaches

3.1. Learning Strategies

To create a rich and effective learning environment, this course utilizes a combination of the three primary learning paradigms: cognitivism, behaviorism, and constructivism[10].

3.1.1. Cognitivism

Leveraging the cognitivist paradigm, the course aligns content with students' majors and individual interests to enhance intrinsic motivation for learning AI. Students can choose topics that interest personally, allowing them to develop a foundational understanding of AI concepts, applications, and functionalities in practical contexts. To support diverse learning styles and deepen their engagement, the course incorporates a range of multimedia elements, including audio, graphics, animations, and videos, which help students retain complex concepts[11]. To foster reflective learning, students are encouraged to share study summaries and insights, and to participate in forum discussions that facilitate peer learning and critical engagement. Participation is rewarded with points contributing to the final grade, serving as an extrinsic motivator that complements their intrinsic interest and encourages consistent engagement.

3.1.2. Behaviorism

Aligned with behaviorist principles, the course includes carefully designed activities where students contextualize theoretical concepts by applying them to real-world tasks[12]. Each project typically includes 2-3 progressive subtasks that support gradual learning. Each subtask starts with a question related to the subtask goal, prompting students to attempt solving it independently by drawing on prior knowledge or reviewing instructional materials. Next, new skills, key concepts, and potential challenges are introduced through a series of guiding questions, helping students refine their approaches and improve accuracy and effectiveness. Students then strengthen their ability to transfer and apply knowledge by working on extension or similar tasks. This iterative process reinforces learning by progressively guiding students to adjust their behaviors, leading to improved applications of AI.

3.1.3. Constructivism

Embracing constructivist principles, each practical task enables students to actively construct their understanding of AI concepts, enhancing both knowledge retention and skill development. After each guided subtask, students apply their newly acquired knowledge or skills to solve

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problems, which reinforces their understanding through applications. Through cycles of independent problem-solving, guided feedback, and practical applications, students build more robust knowledge that connects theoretical AI principles to real-world scenarios.

By integrating cognitivism, behaviorism, and constructivism, the course addresses multiple facets of learning, caters to diverse learning preferences, and promotes a holistic educational experience that enhances student engagement and success.

3.2. Instructor Roles and Engagement

Table 1. Learning and Teaching Strategies with Learning Outcomes

Learning Strategies	Teaching Strategies	Learning Outcomes
Cognitivism	• **Personalized Content:** Prepare course materials with students' majors and interests to enhance intrinsic motivation. • **Multimedia Resources:** Using audio, visuals, and interactive media to support different learning styles. • **Reflective Activities:** Encouraging summaries and discussions to deepen understanding.	• **Foundational Knowledge:** Understand fundamental AI concepts and principles. • **Relevance to Field:** Relate AI knowledge to specific practial contexts. • **Engagement and Motivation:** Increased enthusiasm for learning due to personalized and engaging content.
Behaviorism	• **Progressive Tasks:** Design projects with increasing complexity. • **Feedback:** Providing timely responses to reinforce correct understanding. • **Repetition and Practice:** Encouraging mastery through practice and applications.	• **Skill Acquisition:** Develop practical AI skills through hands-on activities. • **Applications Proficiency:** Ability to perform tasks using AI tools. • **Confidence Building:** Gain confidence in using AI through successful task completion and positive reinforcement.
Constructivism	• **Problem-Solving Opportunities:** Offering real world problems for students to solve. • **Knowledge Construction:** Facilitating the building of new knowledge based on existing understanding. • **Collaborative Learning:** Promoting peer and group interaction and knowledge sharing.	• **Critical Thinking:** Enhance problem-solving skills by solving real-world AI challenges. • **Deep Understanding:** Achieve a robust grasp of AI applications through active learning. • **Collaboration Skills:** Develop the ability to work effectively with others in learning tasks.

To tailor the course content appropriately, instructors assess students' prior knowledge and skill levels. This is achieved through a preliminary questionnaire that assess their current understanding of AI concepts. Additionally, instructors select applications topics relevant to students' majors and upload supplementary materials on diverse applications scenarios to the learning platform, ensuring the content is aligned with students' interests and academic backgrounds.

During practical tasks, instructors employ a series of carefully designed questions to guide students along a gradual learning path. These questions are designed to encourage critical thinking, challenge students' existing understanding, and prompt them to progressively apply knowledge from basic to more complex AI concepts.

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Throughout the learning process, instructors actively support students by responding to their inquiries, clarifying complex concepts, and providing timely feedback. This ongoing interaction addresses individual questions, reinforces understanding through real-time guidance, and fosters an interactive and responsive learning environment.

These teaching strategies directly support the course objectives by enhancing students' understanding of AI concepts and their ability to apply them in practical contexts, thereby preparing them for success in the AI-driven job market.

Table 1 illustrates the summary of the three primary learning paradigms with specific teaching approaches to achieve the course objectives. This alignment ensures that the educational strategies are effectively meeting the diverse learning needs of liberal arts students, fostering both theoretical understanding and practical skills in AI applications.

4. Results

Since 2022, the AI Applications Course for Liberal Arts has been conducted over four semesters at Shenzhen Polytechnic University, significantly enhancing liberal arts students' understanding of AI technologies while cultivating their interdisciplinary and critical thinking abilities.

A total of 661 students participated in the pre-course assessment for the 2023 autumn semester, with a gender distribution of 30.4% male and 69.6% female. The assessment revealed that 78.8% of students had never used generative AI before the course, and 38.0% indicated they were not proficient in any software operations. After completing the course, many students expressed that they had learned a substantial amount and had become proficient in using at least one large language model. Among the 641 students who completed the course, the final grade distribution is shown in Figure 2. The transition from 78.8% of students with no prior experience in generative AI to a majority achieving proficiency illustrates the course's success in building foundational AI skills. Additionally, the low failure rate suggests that the course was accessible and supportive for students with diverse technical backgrounds.

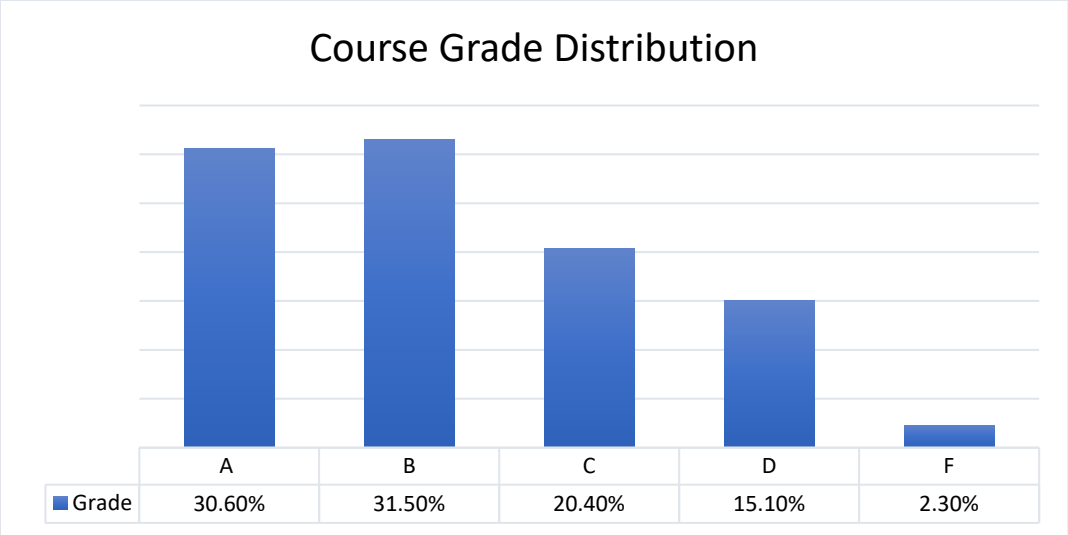

Figure 2. Course Grade Distribution in 2023 Autumn Semester

After completing the course, students selected topics aligned with their personal interests and majors, enabling them to transfer and apply AI knowledge in practical contexts. This resulted in a range of high-quality projects, including career planning presentations, system prototypes, and data analysis visualizations. For example, a preschool education major created a structured

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and inspiring career planning presentation using a large language model, showcasing effective AI tool utilization. A student in Intelligent Elderly Care major developed a prototype for an abnormal heart rate detection system, combining AI with domain-specific expertise. Additionally, students majored in Business German and French used web crawler tools to collect job postings of interest, analyzed job requirements, and visulized the data to assist with career planning.

The course's impact is further evident in the students' successes in various academic competitions. Students received numerous awards. Notably, students received a first prize, a second prize, and two third prizes in the "Undergraduate Student Competition of Computer-Aided Design in Guangdong Province." They also secured second and third prizes in the "National College Computer Skills Challenge." Moreover, a team of students and faculty earned the second prize in the "Huashu Cup International Mathematical Modeling Competition." These achievements underscore the course's effectiveness in enhancing technical applications and problem-solving skills, as well as students' ability to perform competitively at high levels.

Overall, these results demonstrate that the AI Applications course has successfully empowered liberal arts students to acquire and apply AI knowledge effectively. The students' achievements in producing high-quality projects and earning accolades in competitions reflect the course's success in meeting its objectives and enhancing students' preparedness for an AI-driven world.

5. Discussion

The design and implementation of the AI Applications course provide valuable insights for future AI curriculum development within liberal arts education. By employing a progressive learning pathway and personalized support, the course effectively helps students build AI applications skills in practical contexts. This approach addresses the challenges faced by liberal arts students, such as limited prior experience with technical subjects, and demonstrates that with the proper pedagogical strategies, these obstacles can be overcome. Consequently, the course contributes to bridging the gap between technical and non-technical disciplines in higher education.

The course serves as a valuable model for other programs aiming to integrate AI into liberal arts curricula. Key aspects contributing to its success include:

Interdisciplinary Integration: Bridging the gap between AI technologies and liberal arts disciplines by tailoring content to students' majors.

Student-Centered Learning: Focusing on individual interests and providing flexible learning paths to enhance motivation and engagement.

Practical Applications Emphasis: Prioritizing hands-on experiences that enable students to apply AI concepts in practical, meaningful ways.

The outcomes and student achievements indicate that the "Artificial Intelligence Applications for Liberal Arts" course not only enhances students' understanding and applications of AI but also strengthens their future competitiveness. Graduates of this course are better equipped to navigate an AI-driven society, contributing interdisciplinary perspectives to the workforce.

During the course implementation, new challenges emerged, such as varying levels of technical proficiency among students. These issues could be addressed through adaptive teaching strategies, including supplementary tutorials for students needing additional support, as well as collaborative learning activities to foster peer-to-peer assistance. Additionally, incorporating AI-based assistance in future iterations may further enhance personalized learning support.

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