

A Study on the Reform and Innovation of College Economics Courses Based on Artificial Intelligence Technology

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Abstract: *This paper explores the potential of utilizing artificial intelligence technology to reform and innovate the teaching of economics courses. Firstly, it points out the problems of excessive theory, lack of practicality, single teaching method, lack of frontier, and lack of interdisciplinary integration in the economics courses of traditional colleges and universities. Second, the feasibility of applying artificial intelligence in economics courses in colleges and universities is analyzed, and the role and technical performance of AI technology in the field of education are introduced. Finally, the technical, pedagogical, psychological, and ethical problems that may be faced by using AI technology in economics classrooms in colleges and universities are discussed, and corresponding solutions and strategies are proposed.*

Keywords: Artificial intelligence; Economics curriculum; Higher education; Reform and innovation.

1. INTRODUCTION

Economics is a social science that studies how people make decisions and interact with each other in a variety of contexts, and it involves the understanding and interpretation of markets, trade, production, consumption, income, wealth, inequality, growth, development, and many other aspects. The economics curriculum is designed to empower students with the knowledge and skills to understand and analyze economic phenomena and develop critical thinking, problem analysis and solving skills, and communication and collaboration skills. Therefore, teaching economics courses is of great significance and value to higher education.

However, teaching economics courses in colleges and universities may face multiple challenges in the actual classroom teaching process, including complex and abstract theories, lack of motivation of students' interest, lack of cutting-edge course content, and interdisciplinary integration. In many cases, the economics teaching mode in colleges and universities has lagged behind the pace of the times, with students learning passively in the classroom, and teachers evaluating students using uniform standards (Kuang Xianglin, 2022; Jiang Shengming, 2022; Qi Wenhao et al, 2018). To cope with these challenges, this paper will explore how to use artificial intelligence technology to reform and innovate the teaching of economics courses in colleges and universities.

Artificial Intelligence, an important branch of computer science, aims to create machines or systems capable of performing tasks that in the past usually required human intelligence to accomplish. Such AI-based systems are equipped with powerful learning, reasoning, understanding, communicating and creating capabilities. In real life, AI has been widely used in various fields such as healthcare, business, entertainment, and education (Stone et al., 2016).

In this paper, we take artificial intelligence technology as the starting point, and we will discuss how to reform and innovate the teaching of economics courses with the help of artificial intelligence technology, aiming at injecting new vitality and possibilities into economics education. At the same time, we will also analyze the challenges that may be encountered when using AI to teach economics courses and propose corresponding solutions for educators and policymakers to provide reference and reference.

2. LITERATURE REVIEW

2.1 An Overview of the Literature Related To Classroom Instruction in Economics Courses

In this section, we will review the existing literature focusing on research related to economics courses based on AI features. First, we will provide an overview of general research on teaching economics courses, and then introduce

the concept of AI in education and related theories.

Teaching economics courses is a challenging task requiring teachers to possess many teaching techniques and strategies. The book *Teaching Economics: More Alternatives to Chalk and Talk* by Becker et al. (2006) offers innovative teaching methods for economics education that go beyond traditional approaches. It offers a range of alternative strategies for effective teaching in economics and encourages educators to explore diverse teaching techniques. However, actual economics classroom instruction still faces many challenges. Many students continue to have low levels of understanding and literacy in economics after taking an entry-level economics course, and many students hold negative attitudes and perceptions about economics and lack motivation, interest in participation, and self-confidence in learning economics (Qu & Wang, 2023). However, if more active engagement features are added to the design of classroom instruction so that students can experience first-hand real-world problems related to economic theory, the effect will be greatly improved (Craig et al., 2022; Wang & Qu, 2023). With the advancement of digitalization and artificial intelligence, it is more important than ever for students to be economically literate, as this economic knowledge is linked to the growing need to make rational decisions that will affect the future (Haupt, 2021).

These same problems exist in the teaching of economics courses in China, where students have a simpler way of acquiring information, and due to the influence of traditional Chinese exam-oriented education, the teaching mode generally adopts a duck-filling approach, which leads to the students' subjective initiative being neglected and only passive acceptance, which is not effective in the classroom under such a teaching environment (Yang, 2017). These findings highlight the need to reform and innovate economics classroom teaching to enhance student's learning effectiveness and experience. With the continuous development and promotion of Internet technology, the deep integration of big data, cloud computing, artificial intelligence, and education and teaching, classroom teaching methods have undergone fundamental changes, and many disciplines have shifted from a single "face-to-face teaching in the offline classroom" to a diversified "online and offline integrated teaching" mode (Yang, 2017). Many disciplines have changed from a single "offline classroom face-to-face teaching" mode to a diversified "online-offline integrated teaching" mode (Yang et al., 2020; Rui et al., 2021; Liu, 2022).

2.2 Concepts of Artificial Intelligence in Education and Related Theories

Artificial intelligence in education can be defined as the use of computer systems or software to support or enhance teaching and learning processes and outcomes (Stone et al., 2016). The application of AI technology in education can be understood in the following ways:

2.2.1 Characteristics of Artificial Intelligence

Artificial Intelligence has several key properties, namely learning, reasoning, understanding, communicating, and creating. These characteristics enable AI to learn from data, reason about problems, understand natural language, communicate with humans, and generate latest content or solutions.

2.2.2 The Role Played by Artificial Intelligence in Education

Artificial intelligence can play several key roles in education, namely personalization, adaptivity, interaction, engagement, and creativity (Stone et al., 2016). These roles enable AI to customize learning content, pace, difficulty, feedback, and advice based on each learner's individual needs, preferences, goals, abilities, and progress; adapt learning environments, activities, and interactions to each learner's changing conditions, contexts, and situations; facilitate communication and collaboration between learners, teachers, peers, experts, and others through natural language processing, speech recognition, and chatbots; increasing learner motivation, interest, curiosity, and fun through gamification, storytelling, simulation, and virtual reality; and enabling learners to express their creativity and innovation by generating new content, products, solutions, or ideas through the use of machine learning algorithms, computer vision, and natural language generation.

2.2.3 Technical Performance of Artificial Intelligence in Education

The technological manifestations of artificial intelligence in education can be classified into the following categories, namely machine learning, natural language processing, intelligent teaching systems, and gamified learning (Luckin et al., 2016). Machine learning is a subset of artificial intelligence that focuses on creating systems or models that can learn from data without being explicitly programmed. Machine learning can be used to

analyze large amounts of data about learner behaviors, actions, responses, and outcomes and use them to make predictions, recommendations, or decisions. Natural Language Processing is a subset of Artificial Intelligence that focuses on creating systems or models that can understand and produce natural language (spoken or written). Natural language processing can be used to provide learners with natural, humanized communication and feedback through text or speech. Intelligent instructional systems are computer-based systems that provide personalized and adaptive instruction based on the needs and goals of individual learners. Intelligent instructional systems can mimic the role of a human tutor or mentor by providing explanations, prompts, scaffolding, feedback, assessment, and remediation. Gamified learning is an approach that uses game elements and principles to design and implement learning activities. Gamified learning can increase learner motivation, engagement, and enjoyment by providing challenges, rewards, feedback, and context.

2.3 Theoretical Frameworks Related to the Application of Artificial Intelligence Technology in Education

To better understand and evaluate the role and effectiveness of AI in education, this paper will draw on the following theoretical frameworks related to the use of AI technologies in education:

2.3.1 Cognitive Load Theory

Cognitive Load Theory (CLT) refers to a cognitive psychology theory proposed by John Sweller and others in 1988, which analyzes the impact of different types of cognitive load on learning effects based on working memory and long-term memory and proposes some principles and strategies for optimizing instructional design. The connection or applicability between the cognitive load theory and the teaching of economics courses is mainly reflected in the following aspects:

Table 1: Applicability of Cognitive Load Theory to Economics Education

Type of cognitive load	Definition	Effect	Optimization strategies for economics courses	Applicability of economics education
Intrinsic cognitive load	Cognitive load is determined by the inherent complexity of the learning material and the learner's prior knowledge.	Excessive intrinsic cognitive load takes away from working memory capacity and affects learning outcomes.	Segmentation	Split complex economics content into simple sub-parts and present them to the learner step-by-step to avoid presenting too much information at once.
			Simplification	Remove unnecessary or minor information from the economics content to emphasize the focus and core and to avoid causing distraction or confusion.
			Organization	Organize the relevant information elements of economics content into a meaningful whole, forming a schema or framework to avoid scattered or random information.
			Analogy	Analogize abstract concepts or models in economics content that are difficult to understand with concrete things or situations that are familiar to the learner to make connections or mappings and avoid a lack of intuition or background knowledge.
External cognitive load	Additional cognitive load induced by the presentation of instructional materials and teaching methods.	Excessive external cognitive load interferes with working memory processing and affects learning outcomes.	Integration	Integrate multiple information media such as text, images, and sound in economics content into a unified expression to avoid separation or conflict.
			variation	Flexible use of different teaching media and tools, such as blackboards, slides, videos, animations, etc., according to the characteristics and difficulty of the economics content, avoiding a single or stereotyped approach.
			Interaction	To avoid passivity or boredom, utilizing AI technology to provide learners with more opportunities and ways to interact, such as quizzes, discussions, polls, games, etc.
Relevant	Beneficial	Appropriate and	Inspire	At the beginning of instruction, learners are

cognitive load	cognitive load generated by the link between the task and prior knowledge.	relevant cognitive load promotes conversion between working memory and long-term memory and improves learning outcomes.		presented with questions or situations related to the content of economics that stimulate their interest and curiosity and lead them to think and explore.
			Apply	During the teaching process, learners are shown some cases or examples related to the content of economics, so that they can observe and analyze them and apply what they have learned to solve problems.
			Reflection	At the end of instruction, learners are presented with some feedback or evaluation related to the economics content, allowing them to review summarize, and reflect on the meaning and value of what they have learned.

2.3.2 Self-Determination Theory

Self-Determination Theory (SDT) refers to a theory proposed by Edward Deci and Richard Ryan in 1985 to explain human motivation and behavior. The theory is based on autonomy, competence, and belongingness, analyzes the effects of different types of motivation on human behavior and achievement, and proposes some conditions and strategies to promote intrinsic motivation and autonomous behavior. The connection or applicability between self-determination theory and the teaching of economics courses is mainly in the following aspects:

Table 2: Applicability of Self-Determination Theory to Economics Education

Psychological needs of self-determination theory	Definition	Effect	Strategies for optimizing the economics courses	Specific strategy content
demand for autonomy	People's choices and control over their behavior.	Economics courses involve a lot of content related to personal or societal choices, which can enhance learners' intrinsic motivation and interest in economics courses if their need for autonomy is met.	Support	Respect and support learners' choice and control over the content of economics by providing some flexible learning options and opportunities, such as self-selected topics, self-paced, self-evaluation, etc., and avoiding coercion or control.
			Explanation	Explain the meaning and value of economics content to learners so that they understand the purpose and significance of their learning and avoid meaninglessness or uselessness.
			Encouragement	Express trust and affirmation to learners, encourage them to try and explore new economics content and methods, and avoid criticizing or punishing.
demand for competence	People's trust and satisfaction in their abilities.	Economics courses involve a lot of content that requires analytical, reasoning, and judgmental skills, which can enhance learners' self-confidence and sense of accomplishment in economics courses if their need for a sense of competence is	Matching	Provide learners with economics content and tasks that are appropriate for them, based on their prior knowledge and ability level, and avoid being too difficult or too easy.
			Feedback	Provide learners with timely, specific, and positive feedback on their progress and achievement, avoiding delayed, vague, and negative feedback.
			challenge	Provide learners with challenging but achievable economics content and tasks that allow them to experience the joy of

		met.		success and growth, and avoid being too easy or difficult.
need for a sense of belonging	People's relationships and interactions with others.	Economics courses involve a lot of content related to social phenomena and issues, and if the learners' need for a sense of belonging is met, it can enhance their engagement and responsibility in the economics program.	Care	Show learners that you care about and respect them, pay attention to their feelings and needs, and avoid neglect or indifference.
			Cooperation	Utilize AI technology to provide learners with more opportunities and ways to work together, such as group discussions, collaborative projects, and online communities, to avoid isolation or competition.
			Recognize	Communicate to learners some of the values and beliefs associated with the economics content so that they identify with and accept the goals and philosophy of the economics program and avoid opposition or rejection.

3. PROBLEMS OF PRACTICAL TEACHING IN ECONOMICS COURSES IN TRADITIONAL COLLEGES AND UNIVERSITIES

3.1 Overly Theoretical

Most of the traditional economics courses are based on theories, but the theories of economics are too abstract and complex to arouse students' interest, and it is also difficult to combine the theories with practical problems, which leads to the difficulty for students to understand and master the knowledge of economics.

3.2 Lack of Practicality

Economics courses often lack practicality, students just passively accept theoretical knowledge, lack practical experience, and can not combine economics theory with practical problems, thus making it difficult to apply what they have learned to solve practical problems.

3.3 Single Method of Teaching

Most of the traditional teaching methods of economics are teachers explaining and students listening to lectures, which lack diversified teaching methods and cannot stimulate students' interest and enthusiasm, thus making it difficult to improve students' learning effect.

3.4 Lack of Cutting Edge

With the continuous development and changes in the field of economics, the teaching of economics courses also needs to be updated and adjusted in time, but at present, the contents of some economics courses are still stuck in the traditional scope of economics, which lacks cutting-edge and innovativeness, and can't satisfy the needs of modern economic development.

3.5 Lack of Interdisciplinary Integration

Economics itself is an interdisciplinary subject, but the teaching of economics courses often lacks integration with other disciplines and fails to combine economics knowledge with other disciplines, thus failing to provide a more comprehensive and integrated body of knowledge.

4. FEASIBILITY ANALYSIS OF ARTIFICIAL INTELLIGENCE APPLICATION IN ECONOMICS COURSES IN COLLEGES AND UNIVERSITIES

Artificial intelligence (AI) in education can be defined as the use of computer systems or software to support or

enhance teaching and learning processes and outcomes (Luckin et al., 2016). The feasibility of AI technology applied to basic economics courses in colleges and universities is high, which can improve the teaching effect and students' learning experience, and promote the modernization and intelligent development of college education.

Table 3: Feasibility analysis of applying artificial intelligence in college economics courses

Feasibility analysis

Data support: the teaching of basic economic courses in colleges and universities requires a large amount of data support, and artificial intelligence technology can process massive data through data mining, analysis and other technologies to improve the efficiency of data use.

Personalised teaching: Students in basic economics courses in colleges and universities have different learning characteristics and needs, and AI technology can make use of students' learning data and historical learning records to carry out personalised teaching and learning resources recommendation, and improve students' learning effect and interest.

Teaching effect assessment: the teaching of basic economic courses in colleges and universities needs to assess the learning effect of students, and artificial intelligence technology can analyse and assess students' learning through learning data analysis and machine learning technology, providing scientific teaching feedback and improvement suggestions.

Teaching automation: the teaching of basic economics courses in colleges and universities can be automated through artificial intelligence technology, for example, through online teaching platforms, automated assessment systems and other tools to improve the efficiency and quality of teaching and reduce the workload of teachers.

Practical teaching: the teaching of basic economic courses in colleges and universities needs to emphasise practical ability and application ability, and AI technology can improve students' practical ability and application ability through virtual laboratories, economic simulation software and other tools, so as to enhance students' professionalism and competitiveness in employment.

The above feasibility analysis of the application of AI in economics courses in higher education is mainly based on the characteristics and roles of AI (see Table 4), which enables AI technology to embody superior technical performance in the field of education (see Table 5).

Table 4: The role of artificial intelligence in education

The role of AI in education	Description
Personalization	AI can customize the learning content, speed, difficulty, feedback, and suggestions according to the individual needs, preferences, goals, abilities, and progress of each learner.
Adaptation	AI can adjust the learning environment, activities, and interactions according to the changing conditions, situations, and circumstances of each learner.
Interaction	AI can facilitate communication and collaboration among learners, teachers, peers, experts, and others through natural language processing, speech recognition, and chatbots.
Participation	AI can increase the motivation, interest, curiosity, and fun of learners through gamification, storytelling, simulation, and virtual reality.
Creation	AI can enable learners to express their creativity and innovation by generating new content, products, solutions, or ideas using machine learning algorithms, computer vision, and natural language generation.

Table 5: The technical performance of artificial intelligence in education

AI technology	Description
Machine learning	Machine learning is a subset of artificial intelligence that focuses on creating systems or models that can learn from data without being explicitly programmed. Machine learning can be used to analyze

	large amounts of data about learner behaviors, actions, responses, and outcomes and use them to make predictions, recommendations, or decisions.
Natural language processing	Natural Language Processing is a subset of Artificial Intelligence that focuses on creating systems or models that are capable of understanding and generating natural language (spoken or written). Natural language processing can be used to provide learners with natural, humanized communication and feedback through text or speech.
Intelligent tutoring system	Intelligent Instructional Systems are computer-based systems that provide personalized and adaptive instruction based on the needs and goals of individual learners. Intelligent instructional systems can mimic the role of a human tutor or mentor by providing explanations, prompts, scaffolding, feedback, assessment, and remediation.

5. CHALLENGES AND CONSTRAINTS

There are also several issues and challenges associated with the use of AI technology in college economics classrooms:

5.1 Technical Issues

Artificial intelligence technologies require significant computing resources, data, and infrastructure to function properly. However, not all educators and students have access to these resources, especially in developing countries or remote areas. In addition, AI technologies may encounter errors, malfunctions, or failures in their use, which can affect the quality and reliability of the teaching and learning process.

5.2 Teaching Issues

Artificial Intelligence is not a substitute for human teachers, but rather a complement or tool. Therefore, educators need to be equipped with the appropriate knowledge and skills to use AI technology to teach effectively and efficiently in their economics courses. Educators also need to design and implement syllabi, activities, and assessments that are aligned with the learning objectives and outcomes of their economics courses. In addition, educators need to monitor and evaluate the effectiveness of the use of AI in influencing student learning outcomes and experiences.

5.3 Psychological Issues

AI technology may have unexpected or negative effects on students' psychological states, such as motivation, interest, confidence, self-efficacy, anxiety, frustration, or boredom. For example, some students may feel overwhelmed or intimidated by the complexity or difficulty of AI technology. Some students may feel dependent or passive because of the guidance or feedback they receive from AI technology. Some students may feel isolated or alienated by a lack of human interaction or social presence.

5.4 Ethical Issues

The widespread use of artificial intelligence may raise ethical questions or concerns about the privacy, security, fairness, accountability, transparency, and trustworthiness of the data and algorithms used in teaching and learning economics. For example, some students may be concerned about the collection, storage, or use of their personal or academic data in the application of AI. Some students may be concerned about bias, discrimination, or manipulation of the results or recommendations provided by AI technologies. Some students may be concerned about the accuracy, validity, or reliability of feedback or assessments provided by AI technology.

To overcome these challenges and constraints, educators, researchers, policymakers, and industry partners can adopt measures and strategies such as providing training and support, designing appropriate instructional materials and activities, conducting research and evaluation, and developing policies and guidelines. Also, educators and students can be actively involved in the process of designing, developing, implementing, and evaluating AI in the classroom teaching of economics courses to ensure that it meets their individual needs and expectations.

6. CONCLUSIONS AND OUTLOOK

In summary, this paper provides an in-depth discussion of the potential and challenges of artificial intelligence in teaching economics courses in colleges and universities. By analyzing the problems of traditional economics

courses, as well as the feasibility and application cases of AI technology in the field of education, we draw the following conclusions:

First of all, artificial intelligence technology provides brand new possibilities for teaching economics courses. Its personalized, adaptive, interactive, and creative features enable students to have a richer and deeper learning experience, thus enhancing the quality and effectiveness of teaching.

Secondly, practical cases around the world show that the teaching of economics courses has achieved remarkable results with the help of AI technology. The successful applications of platforms such as CORE, ECOLEARN, ECONLAND, and the Intelligent Learning Partner of Beihang Normal University provide us with reliable experiences and insights.

However, we must also face up to the technical, pedagogical, psychological, and ethical issues facing the application of AI in college economics programs. The allocation of technological resources, the development of the professional competence of educators, the safeguarding of students' psychological health, as well as data privacy and moral ethics all require our joint efforts.

As AI technology continues to evolve and educational concepts are updated, we are confident that we will see more innovations and practices regarding AI in teaching economics courses in the future. We look forward to educators, researchers, policymakers, and industry partners working together to promote the continued development of this field for the benefit of student learning and growth.

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