

Human-Computer Collaboration Empowering the Teaching of Public Finance in Higher Education

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Abstract: In the digital wave, artificial intelligence (AI) technology has profoundly influenced higher education. The human-computer collaborative teaching model has brought new opportunities for the Public Finance course. Public Finance has highly abstract theories and strong practicality, and traditional teaching has limitations. In contrast, AI technology has advantages in data processing and analysis, such as constructing personalized learning profiles for students and automatically grading and evaluating assignments, which are complementary to teachers' advantages. In teaching practice, before class, AI pushes preview resources according to students' situations and analyzes learning conditions to assist teachers in lesson preparation. During class, teachers guide discussions, AI intelligent teaching assistants provide knowledge support and discussion feedback, and students interact with the help of intelligent devices. After class, AI generates personalized assignments and tests and provides tutoring, while teachers answer questions for students with learning difficulties. However, there are difficulties in practice, such as teachers' insufficient AI application ability and the need to optimize the teaching evaluation system. These can be resolved by providing training, building platforms, and innovating the evaluation system. The human-computer collaborative teaching model has transformed Public Finance teaching and will promote its maturity and improvement.

Keywords: Human-Computer Collaboration, Public Finance, Higher Education.

1. Introduction

In the current digital age, artificial intelligence (AI) technology is permeating various fields at an unprecedented speed. Higher education, as an important base for cultivating future pillars of society, has focused on improving teaching quality. The emergence of AI technology has brought new opportunities and challenges to the teaching of the Public Finance course. The human-computer collaborative teaching model, which combines teachers' professional knowledge with the intelligent advantages of AI technology, is expected to break the limitations of traditional teaching and achieve a qualitative leap in teaching effectiveness. AI can accurately push learning materials, exercise practices, and extended readings suitable for students according to their individual differences, meeting the diverse learning needs of students and stimulating their learning interests and initiatives. For teachers, the human-computer collaborative teaching model is not a weakening of their roles but an empowerment and enhancement. Teachers can be freed from tedious and repetitive teaching tasks such as grading assignments and explaining simple knowledge and devote more energy to teaching design, in-depth interaction with students, and the cultivation of students' comprehensive qualities [1]. With the help of data analysis provided by AI technology, teachers can more accurately understand students' learning difficulties and timely adjust teaching strategies to provide more targeted guidance for students, thus achieving teaching and learning from each other and enhancing their own educational and teaching abilities [2]. A reasonable human-computer collaboration model can stimulate students' metacognitive abilities and prompt them to more actively regulate the learning process [3]. In the era of human-computer collaboration, the roles of teachers and students have changed. Teachers should transform from knowledge transmitters to learning guides, and students should become autonomous

learners and knowledge creators [4]. In terms of educational evaluation, some scholars have proposed constructing a diversified evaluation system based on human-computer collaboration, comprehensively considering students' knowledge mastery, ability improvement, and human-computer collaboration ability and other dimensions to evaluate students' learning achievements comprehensively and objectively [5, 6].

2. The Compatibility of AI and Public Finance Teaching

2.1. Analysis of the Characteristics of the Public Finance Course

Public Finance, as a comprehensive economic discipline, has a highly abstract theoretical system. From basic concepts such as public goods and externalities to core theories such as fiscal balance and tax shifting and incidence, students need strong logical thinking and abstract understanding abilities. Taking public goods as an example, their non-excludability and non-rivalry characteristics are not as intuitive as private goods in daily life. Students need to understand their connotations and significance through complex economic phenomena and theoretical derivations, which is undoubtedly a great challenge for beginners. This course is closely connected with the real economy and has strong practicality. Contents such as the formulation and implementation of fiscal policies, the reform of the tax system, and the preparation and execution of the government budget require students to deeply understand the actual economic operation status based on mastering theoretical knowledge before they can apply what they have learned. For example, in recent years, China has implemented value-added tax reforms and individual income tax special additional deductions. Students not only need to know the policy provisions but also need to understand the economic motives behind them, the

implementation effects, and the impacts on different economic entities. This requires the teaching process to be closely combined with real cases and practical scenarios. When dealing with these characteristics of the Public Finance course, the traditional teaching model has exposed many limitations. Teachers' classroom teaching often focuses on theoretical indoctrination. The explanation of abstract concepts easily makes students feel bored, resulting in a decline in learning enthusiasm. The practical teaching link is weak. Although students are familiar with textbooks, they are often at a loss when facing actual fiscal problems, and the phenomenon of "two skins" between theory and practice is prominent. The update cycle of textbooks is long, and the knowledge is outdated. It is difficult to convey the latest academic research results and policy developments to students in a timely manner, unable to adapt to the rapid development of the discipline. Therefore, introducing AI technology and exploring the human-computer collaborative teaching model has become an urgent need to break the teaching dilemma of Public Finance and improve teaching quality..

2.2. Advantages of AI Technology in Public Finance Teaching

AI technology has brought many revolutionary advantages to education and teaching with its excellent data processing and analysis capabilities. In the teaching scenario of the Public Finance course, these advantages are particularly significant and provide innovative paths to solve traditional teaching problems. AI can accurately and efficiently process massive learning data and deeply analyze students' learning behaviors, knowledge mastery levels, and learning preferences and other multi-dimensional information. By collecting and analyzing data such as students' operation records on online learning platforms, assignment completion situations, and classroom interaction performances, AI can construct a personalized learning profile for each student. For students majoring in Public Finance, AI can identify their mastery of different knowledge points such as tax policy understanding and government budget preparation. For example, if it is found that students have difficulties in applying the principle of tax shifting and incidence, the AI system can accurately locate the problem and provide a basis for subsequent personalized learning support. The AI system can realize the automatic grading and evaluation of students' assignments, tests, and other learning achievements. It can not only quickly give objective grade evaluations but also provide detailed and targeted feedback suggestions based on in-depth analysis of students' answering situations. After an exam in the Public Finance course, AI can quickly point out the error types and sources of students' questions such as fiscal balance calculations and tax case analyses, guide students to review and improve targeted, and at the same time, provide data support for teachers to adjust teaching strategies and optimize teaching priorities based on the overall answering performance of students, realizing the dynamic optimization of the teaching process.

3. Construction of the Human-Computer Collaborative Teaching Model

3.1. Before Class: AI-Assisted Resource Pushing and Learning Condition Analysis

In the pre-class preparation stage, with the help of the intelligent learning platform, AI can customize a personalized preview resource package for each student according to their past learning data, knowledge mastery levels, and learning preferences. For students majoring in Public Finance, if the system identifies that a certain student is relatively weak in macroeconomics fundamentals, it will push resources such as micro-videos that explain the origin and development of Keynesian fiscal policy in a simple way, electronic documents that analyze the relationship between macroeconomic indicators and fiscal policy with easy-to-understand cases, and interactive preview questionnaires that include basic concept self-tests and feedback. These resources can help students lay a solid knowledge foundation in advance and prepare for classroom learning. At the same time, the AI system can also collect various data in real-time during students' preview process, such as learning time, resource browsing tracks, answer correctness rates and error points, and generate a detailed learning condition report through in-depth analysis and feedback it to the teacher. Based on these accurate feedbacks, teachers can understand students' preview difficulties and knowledge blind spots, and then flexibly adjust the classroom teaching plan, focus on explaining the knowledge points with common problems, and prepare extended content for students with spare capacity to ensure that classroom teaching closely meets the actual needs of students and realizes precise teaching.

3.2. During Class: Integration of Multiple Interactions among Teachers, Students, and Computers

Teachers, as the organizers and guides of the classroom, throw out inspiring Public Finance questions, such as "In the context of the booming digital economy, how to re-examine the effectiveness and adaptability of the traditional tax collection and management model?" to stimulate students' thinking enthusiasm and organize students to conduct group discussions. During the discussion process, the AI intelligent teaching assistant is online in real-time. On the one hand, it provides students with instant knowledge support, such as quickly retrieving and pushing the latest research materials on digital economy tax collection and management and innovative practice cases at home and abroad to help students broaden their thinking horizons and enrich their argument materials. On the other hand, through intelligent voice recognition and analysis technology, it accurately captures the key points of students' speeches and provides teachers with visual discussion dynamic feedback to help teachers understand students' thinking directions and discussion depths in real-time, so as to timely guide and correct deviations and ensure the correctness and depth of the discussion direction. Students, with the help of intelligent terminal devices such as tablets and intelligent learning pens, actively participate in the interaction. They can not only conveniently consult the materials pushed by AI but also use intelligent drawing and data analysis software and other tools to transform abstract Public Finance theories into intuitive

charts and models. For example, they can construct a dynamic simulation model of the impact of tax policies on enterprise costs to present their views in a more intuitive way, enhance the expression effect, and improve the sense of participation and achievement in learning. Through multiple rounds of interactions and feedbacks among teachers, students, and computers, the classroom teaching is jointly promoted to develop in depth, and the Public Finance knowledge is deepened and absorbed in the collision of ideas.

3.3. After Class: Intelligent Evaluation and Personalized Tutoring Follow-up

After class, the AI system automatically generates personalized homework and tests based on the classroom learning content and teaching objectives. The questions are stratified in difficulty and cover all knowledge points. They can not only accurately test students' mastery of the core knowledge in class but also explore students' knowledge transfer and application abilities through extended questions. After students complete and submit their homework, AI quickly grades it and not only gives accurate grade evaluations but also generates a detailed error analysis report for each wrong question, indicating the error type, the involved knowledge points, and the correct problem-solving ideas, providing students with a clear learning improvement direction. Based on the evaluation results, AI customizes a personalized review and extension plan for each student. For students with weak foundations, it pushes micro-lesson videos and special exercises to strengthen basic knowledge. For students with spare capacity, it recommends frontier academic papers in Public Finance and opportunities to participate in high-end online academic seminars to meet the learning needs of different levels of students. Teachers, based on the overall learning condition data provided by AI, conduct targeted online or offline question-answering and tutoring for students with learning difficulties and record explanation videos for knowledge points with common problems to supplement the learning resource library. They cooperate with AI to provide students with all-round and multi-level after-class learning support to ensure the continuous consolidation and improvement of learning effects.

4. Difficulties and Solutions in the Teaching Practice of the Human-Computer Collaborative Public Finance Course

4.1. Improvement of Teachers' AI Application Abilities

In the promotion process of the human-computer collaborative teaching model, teachers, as the organizers and guides of teaching activities, their AI application abilities directly affect teaching effectiveness. In reality, many teachers have shortcomings in technology application. Their understanding of AI technology only stays on the surface, and it is difficult to integrate it deeply into teaching practice, resulting in obstacles in the teaching process and a significant reduction in students' learning experiences. To solve this dilemma, schools and education departments should work together to improve teachers' AI application abilities in multiple dimensions. On the one hand, organize and carry out systematic and targeted AI technology training courses, covering AI basic knowledge, intelligent teaching tool

operation, data-driven teaching design, and other contents. Invite experts, scholars, and technical backbones to teach. Through a combination of theoretical explanation, case demonstration, and practical operation drills, help teachers lay a solid technical foundation and master the use skills of various AI teaching tools proficiently. On the other hand, build a teacher communication and sharing platform to encourage teachers to share their experiences and confusions in human-computer collaborative teaching practice and promote mutual learning and common growth. Regularly hold teaching seminars and workshops to allow teachers to spark their thinking in communication and explore innovative teaching methods. In addition, actively encourage teachers to participate in AI education-related scientific research projects. Deepen their understanding and application abilities of technology in research and prompt teachers to feed back the latest scientific research achievements to teaching practice, realizing the Positive interaction between teaching and research and injecting continuous innovation vitality into human-computer collaborative teaching.

4.2. Teaching Optimization of Human-Computer Collaboration

With the implementation of the human-computer collaborative teaching model, the teaching evaluation system also needs to keep pace with the times. The traditional single evaluation method mainly based on test scores is difficult to comprehensively and objectively measure students' learning achievements and comprehensive quality development in the human-computer collaborative teaching model. Dimensions such as the improvement of students' autonomous learning abilities, the stimulation of innovative thinking, and the cultivation of teamwork spirit under the assistance of AI should be included in the evaluation scope. At the same time, the evaluation of teachers should also take into account their performance in teaching design innovation in human-computer collaboration, the ability to guide students to interact with AI, and teaching reflection and improvement. To meet the above challenges, we should innovate the teaching evaluation system, construct diversified and process-oriented evaluation indicators, and comprehensively use multiple evaluation methods such as classroom performance observation, learning achievement evaluation, student self-evaluation and peer evaluation, and AI data analysis to comprehensively and accurately reflect the growth and progress of teachers and students in human-computer collaborative teaching. Reasonably allocate teaching resources, increase investment in intelligent teaching infrastructure, and establish a dynamic update mechanism for teaching resources to ensure the real-time matching of resource supply and teaching needs, creating a good environment for the continuous promotion of human-computer collaborative teaching and helping to improve the quality of higher education teaching to a new level.

5. Conclusion and Prospects

This study deeply explores the human-computer collaborative teaching model in the Public Finance classroom. Through theoretical analysis, empirical research, and case studies, it reveals the all-round transformation and significant effects of human-computer collaboration on Public Finance teaching. At the same time, it also faces the challenges directly and proposes corresponding strategies. With the help

of AI, students' needs can be accurately located to achieve personalized teaching. The teaching process reconstruction covers the whole process before, during, and after class. Before class, AI-assisted resource pushing and learning condition analysis lay the foundation for precise teaching. During class, the integration of multiple interactions among teachers, students, and computers stimulates classroom vitality. After class, intelligent evaluation and personalized tutoring follow-up consolidate and expand learning achievements. Teachers' roles have transformed from dominators to guides, focusing on inspiring students' thinking and value guidance. Students' subject status has become prominent, and they have become active explorers and creators. AI intelligent agents act as teaching assistants and enablers, enhancing the efficiency of each teaching link.

In the future, the human-computer collaborative teaching model in the Public Finance classroom will have a broader development prospect. Many positive transformation trends are expected to reshape the new pattern of Public Finance teaching in higher education. The teaching model will become more mature and perfect, and the depth and breadth of human-computer collaboration will continue to expand. The cooperation between teachers and AI intelligent agents

will be more tacit. Teachers will be able to use AI technology more skillfully, accurately grasp students' needs, and provide students with more personalized and targeted guidance. AI will be able to better understand the teaching scene and provide teachers with more valuable teaching decision support, such as intelligently generating diversified teaching plans for teachers to choose from, assisting teachers in conducting precise learning condition diagnosis and teaching evaluation, and realizing the refined management of the teaching process.

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