Research on the Cost Benefit of AI Technology and Teacher Innovation Development in Economic

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Abstract. The foundation of education lies in responding to the times. In the wave of digital transformation in education, AI technology has moved from "pilot exploration" to "large-scale promotion" in the field of economic education. However, it still faces the dilemma of "high cost" and "scattered benefits" - with only intelligent tools, if the teacher's educational core is not adapted to technology, it will be difficult to demonstrate the effectiveness of education. This article is based on the cost-benefit framework of economic education, combined with domestic practices such as the "Smart Education Demonstration Zone" and "AI+Education" special projects. With a scholarly attitude of "studying the world and understanding the changes of the past and present", through literature research, policy analysis, and case analysis, it explores the triple costs (explicit hardware, implicit adaptation, and continuous operation and maintenance) and three-dimensional benefits (efficiency improvement, personalized supply, and resource balance) of AI education technology. The focus is on analyzing the bottlenecks of teacher innovation and development: technological capability gaps, lack of incentive mechanisms, and insufficient collaboration between teaching and technology. Research has found that the benefits of AI education are not solely related to investment, but rather to the linkage of "cost optimization benefit transformation teacher empowerment"; Only by building regional resource sharing to reduce costs, creating a "technology+teaching" integrated training, and improving innovation evaluation, can we achieve two-way empowerment - not only to warm up the landing of technology, but also to enable teachers to uphold their original intention of educating people in the process of change. This article provides a practical path for the application of AI in economics and education, as well as a theoretical framework for teachers to adapt to the digital ecosystem.

Keywords: Economic Education; AI Educational Technology; Cost-Benefit Analysis; Teacher Innovation and Development; Digital Transformation of Education.

1. Introduction

The "Education Informatization 2.0 Action Plan" and "China's Education Modernization 2035" are the sails, and AI technology has become the core driving force for the high-quality development of education. In the field of economic education, its presence has penetrated into curriculum design, learning situation analysis, and skill training - vocational colleges use AI to simulate the market, helping students understand supply and demand and costs; Universities rely on intelligent evaluation to achieve automatic grading and personalized feedback of economics assignments. Behind the empowerment of technology lies the heavy cost for educational institutions: the annual fee for an AI adaptive system in primary and secondary schools is hundreds of thousands of yuan, the operation and maintenance cost of economic AI laboratories in universities is increasing year by year, and there are even hidden hardships for teachers to reconstruct lesson plans and learn operations. Moreover, some schools' AI devices have become mere decorations, as teachers find it difficult to integrate technology and teaching, resulting in a hollow shell of "AI for AI's sake" and deviating from the millennium old educational philosophy of "teaching according to individual needs" [1].

The allocation of educational resources has always sought to make the best use of resources. The introduction of AI is essentially an upgrade of educational elements, and its value must be tied to the core of "passing on the torch" of teachers. Currently, the academic community focuses more on the functions or teaching models of AI technology, but rarely evaluates the rationality of its application from an economic perspective, and neglects the linkage between teacher innovation and technological benefits. Based on this, this article is based on the cost-benefit logic of economic education, combined

with domestic public policies, academic achievements, and practices such as Zhejiang's "Smart Education Demonstration Zone" and Guangdong's "AI+Education", to sort out the costs and benefits of AI, analyze the key role and challenges of teacher innovation, propose collaborative paths, provide reference for educational institutions to rationally use AI and teachers to adapt to the digital ecosystem, and also fill the theoretical gap in educational technology research from the perspective of economic education.

2. Defining the Core Concepts of AI Technology and Teacher Development from the Perspective of Economic Education

2.1 Cost Benefit Analysis Framework of Economic Education

The cross disciplinary integration of education and economics in economics and education focuses on optimizing educational practices through the theories of "resource allocation" and "cost-benefit", in order to achieve the goal of "maximizing the use of resources". In the application of technology, the essence of its framework is the adaptation of "full cycle cost" and "multiple benefits" - the former includes full investment in technology procurement, operation and maintenance, training, etc., while the latter needs to balance the improvement of teaching efficiency and the protection of the "original intention of educating people", such as cultivating students' innovative thinking and promoting educational equity, rather than solely relying on economic indicators. Just as the introduction of AI economic case analysis system calculates the cost of authorization and training, and the benefits depend on students' understanding of economic theory, this is precisely the modern educational interpretation of the ancient saying "keep within your means", which sets a standard for "rational investment" in AI application.

2.2 Core Types and Application Characteristics of AI Educational Technology

The AI technology in the field of economic education can be classified into three types of "assistance": one is the "intelligent companion learning type", such as the economics adaptive system, which teaches students according to their aptitude like traditional "private tutors" and dynamically pushes knowledge points based on students' answers; The second is the "virtual training type", such as the AI economy laboratory, which simulates market fluctuations like a "sand table exercise" and allows students to practice cost accounting; The third type is "intelligent grading", such as automatic grading tools, which save teachers the trouble of repeated grading. [2]

Although this type of technology has the advantages of "interaction, individuality, and data-driven", it also requires the adaptation of "to do a good job, one must first sharpen their tools" - if teachers do not understand the intersection of technology and teaching, even the most intelligent tools will become "decorations".

2.3 Connotation and Core Dimensions of Teacher Innovation and Development

The innovation of teachers in the AI era is not just about operating technology, but a deep innovation of "teaching philosophy, methods, and roles", inheriting and upgrading the tradition of "teachers, imparting knowledge and solving problems". The core is to turn AI into a "powerful tool for educating people", with three layers of efforts: first, "integrating technology into education", such as using AI data visualization to talk about macroeconomics, making abstract knowledge come alive; The second is "mode innovation", which implements hierarchical teaching based on AI learning situation, no longer a one-way output of "filling the room"; The third is "role transformation", from "knowledge porter" to "guide", using the time saved by AI to accompany students to explore the livelihood temperature behind economic cases. These three layers are interrelated, forming the 'ability foundation' for teachers to adapt to digital education.

3. The Cost Composition of AI Educational Technology and the Cost Characteristics from the Perspective of Economic Education

The cost of AI education technology is never just the numbers on the ledger, but also the pressure on educational institutions and the hard work of teachers. Universities need to establish AI virtual economy laboratories, and a set of high-performance servers and VR equipment costs 500000 to 1 million yuan; The introduction of AI systems for economic enlightenment in primary and secondary schools incurs an annual software licensing fee of 50000 to 150000 yuan, with additional fees based on the number of students. Once these funds are invested, they are like spilled water - if the operation and maintenance are stopped halfway, the money for server hosting and software updates does not keep up, and the previous investment becomes a "sunk cost", the technology cannot be used, and the already tight budget of grassroots schools is even more suffocated by this "rigid expenditure". What is more easily overlooked than these obvious expenses is the time and energy cost that teachers bury in details. In order to make good use of AI, teachers have to participate in 3-5 days of technical training, followed by advanced learning. The preparation time that should have been used to grade homework and talk to students has been repeatedly squeezed [3].To change the "economic case explanation" to "AI simulation+group discussion", an additional 2 to 3 hours will be spent in each class redesigning lesson plans, adjusting experimental parameters, and repeatedly communicating and debugging with suppliers if the system encounters problems. These implicit costs are not written on the bill, but they are real "human capital consumption" - if these time are spent on traditional teaching and research, perhaps it can more directly help students clarify the difficulties of "supply and demand relationship". This "mismatch between effort and return" often makes teachers more helpless than monetary costs. From the perspective of cost structure, AI education technology is inherently characterized by "high fixed, low margin" nature - algorithm development and data training require high costs during development, but once deployed, having an additional student only adds an account, resulting in extremely low costs. This should have been a good thing of "sharing costs and convenience among everyone", but in reality, it often wastes its advantages due to "using it too narrowly": a high school's AI economic teaching system is only used for 80 students in two classes of the first grade, with an average annual cost of up to 1200 yuan per person; If it can cover 400 students in the entire grade, the per capita cost can be reduced to 240 yuan. Although resources can be brought to life according to the ancient saying of "making the best use of everything", they have become a "niche burden", failing to fully utilize the cost advantage of AI and violating the original intention of "efficient allocation of resources" in economics and education. It is truly a pity.

4. The Benefit Dimension of AI Educational Technology and the Logic of Benefit Transformation from the Perspective of Economic Education

The benefits of AI educational technology are hidden in the sympathy for teachers' hard work and the concern for students' growth. In the past, teachers often found it difficult to grade economic homework, but now intelligent evaluation systems can automatically correct selections, fill in the blanks, and provide brief answers for initial evaluations, greatly reducing time consumption.

According to Xinhua News Agency, the pilot data of iFlytek's Spark intelligent grading machine shows that the manual grading time for homework in each class has been reduced from 90 minutes to 5 minutes, and the statistical analysis of learning situation has been compressed from 60 minutes to 1 minute, which is equivalent to saving teachers more than 90% of mechanical work time and helping teachers focus on deep communication with students. In terms of educational quality, it conforms to the ancient saying of "teaching students according to their aptitude" - the adaptive learning system can accurately locate the weak points of students' "marginal cost" and "supply-demand balance" and push exercises; The virtual economy laboratory supports students to repeatedly try and make mistakes.

Taking the virtual simulation experiment of international trade practice at Shanghai University of International Business and Economics as an example, students cope with risks such as exchange rate

fluctuations in the simulation environment, and their understanding of trade practice and cost control is significantly improved. The project has been rated as a first-class course in national level virtual simulation experiment teaching; Practice at Hunan University of Finance and Economics has also proven that virtual laboratories can help students proficiently master skills such as cost accounting, achieving efficient integration of theory and practice. This benefit also extends to educational equity. AI breaks down geographical barriers, and the 'AI dual teacher classroom' allows excellent economic teachers in first tier cities to remotely guide remote students. According to a report by China Youth Network, Hainan Province has launched over 100000 "dual teacher classrooms" based on the national smart education platform, benefiting nearly 350000 students and effectively alleviating the shortage of rural subject teachers; The Onion Academy Yunnan Baoshan Public Welfare Project shows that teachers who actively use digital resources have significantly higher average A-level rates for their students compared to teachers who do not actively use them. In the long run, this will cultivate students' digital economic thinking, help them develop data analysis and decision-making abilities, adapt to the future workplace, and form a linkage between education and the economy. But the implementation of benefits requires teachers to act as a "bridge": AI learning data needs to be interpreted by teachers in conjunction with key factors such as "inflation", and virtual experiments require teachers to guide students to think about the "differences between experiments and theory" to cultivate critical thinking.

The Onion Academy Yunnan Baoshan project confirms that through the guidance of backbone teachers and technical training, rural teachers have mastered the personalized teaching ability of big data, and students' self-learning ability and academic performance have been synchronously improved, forming a virtuous cycle of "technology teacher student". Without this guidance, the value of technology will be discounted.

At the end of the day, AI never replaces teachers, but through a two-way journey of "technology empowering teachers and teachers empowering students", allowing teachers to break away from mechanical work and focus on the essence of education. Just as Baoting County in Hainan Province activated teachers' enthusiasm through the "Double Teacher Classroom" teaching evaluation, 324 teachers participated in cross subject competitions, promoting the flow of high-quality resources between urban and rural areas. They not only adhered to the original intention of "imparting knowledge and solving problems", but also kept up with the pace of the times [4].

5. The Realistic Dilemma and Constraining Factors of Teacher Innovation and Development in the Application of AI Technology

The dilemma of teachers in the application of AI technology is hidden in the helplessness of "wanting to integrate but difficult to integrate". Many teachers use AI to teach economics courses, still staying at the shallow level of playing videos and assigning homework, with core functions such as learning situation analysis and simulation experiments becoming mere decorations; Seeing the system display '60% accuracy rate for a certain knowledge point', I am unable to combine the pre order theory of 'supply and demand relationship' to understand the learning problem behind the data. The root cause of this ability gap lies in the training of "teaching people how to fish instead of teaching them how to fish" - according to a 2024 survey by the China Academy of Educational Sciences, only 28% of economic teacher training includes "AI+subject case" teaching, and most still only teach system operation steps, without teaching "how to use technology to solve teaching problems"; In addition, some teachers rely on traditional teaching methods. According to the 2025 report by the Teacher Work Department of the Ministry of Education, 35% of middle-aged economic teachers have a clear tendency to fear AI technology, and the fear of learning new things makes it difficult to take a step forward.

What's even more discouraging is that there's no hope for innovation. Nowadays, when evaluating teachers, the focus is still on student performance, paper publication, AI teaching plan design, and technology integration research achievements. However, in the assessment, the weight is pitifully

light - according to a 2024 survey by "China Education Informatization", 67% of universities have an assessment weight of less than 10% for "information technology teaching innovation", and in a certain university, the weight is only 5%, far less than the 40% of scientific research achievements. Schools have not provided support either. The "China Education Development Report (2025)" points out that only 19% of primary and secondary schools have set up AI teaching special funds, and have not established communication platforms for everyone to share their experiences. Teachers spend a lot of time pondering innovation, but cannot receive recognition and support. This "work without effort" gap has led many people to simply return to the "comfort zone" of traditional teaching, and the benefits of AI naturally cannot be realized.

The loneliest thing is the helplessness of fighting alone. Supplier AI is mostly generic and does not meet the needs of economics courses. Malfunctions are only repaired without guiding teaching integration. A 2024 study by Vanderbilt University pointed out that educational AI is generally "subject aphasia": a certain economic simulation system parameter is not related to "supply and demand elasticity", and teachers need to change the preset value by 62%; The explanation of teaching scenarios in technical documents is only 9%, lacking guidelines such as "inflation", resulting in an "effective utilization rate" of less than 40% for AI tools for economics teachers [5]. There is also a lack of interdisciplinary and cross grade teaching and research among teachers. According to the 2025 data from "Digital Education Research", 82% of middle school economics teachers have not participated in cross school AI teaching seminars. One middle school economics teacher finally made a set of "AI simulation market teaching plans", which can only be used in their own class and cannot be shared with more people. This kind of 'one handed silence' puts teachers in a dilemma of innovation, and the cost-effectiveness of AI technology is also difficult to break through.

6. The Collaborative Path of Cost Benefit Optimization of AI Technology and Innovative Development of Teachers from the Perspective of Economic Education

6.1 Cost Optimization Path: Regional Sharing of "People Gathering Firewood" and On-Demand Procurement of "Keeping Expenses Within Limits"

The cost reduction of AI technology is hidden in the collaborative wisdom of "everyone gathers firewood and the flame is high". Breaking the "one-on-one" approach of single school procurement, local education departments take the lead in integrating resources. Like a "smart education demonstration zone" in Zhejiang, the education bureau uniformly purchases AI economic teaching systems for 20 middle schools to share. The average annual cost of a single school has been reduced from 120000 yuan to 25000 yuan, which not only shares the high fixed cost but also establishes a regional AI resource platform - high-quality lesson plans and simulation experiment parameters from each school can be shared and reused, and teachers no longer have to spend effort on repeatedly developing resources. More importantly, the procurement rationality of "keeping expenditures within the limits of income" is emphasized. The school first understands the teaching needs: a vocational college identified "AI cost accounting simulation" as the core requirement through questionnaire interviews, and only purchased corresponding modules instead of the complete system. The initial cost was reduced by 40%, and the subsequent operation and maintenance burden was reduced, avoiding the waste of "buying but not using". This is a modern practice of the traditional concept of "saving money and loving others".

6.2 Teacher Empowerment Path: Integration Training of "Teaching People to Fish" and Innovative Support of "Recognition and Incentive"

To help teachers overcome the "hurdles" of AI applications, we cannot only teach operational steps, but must take the path of "teaching people how to fish". Training should be tailored to the needs of economic courses, such as how to use AI to analyze and adjust the teaching focus of "monetary

policy", and how to design "AI simulated market+group discussion" classrooms. Yu Tonghui et al. (2025) proposed that generative AI training should focus on the core of economics, and teachers can use AI to generate "monetary policy transmission data" to locate students' understanding blind spots, or use "market competition scenarios" to generate discussion topics [6]. Empirical research in 2025 shows that in economics simulation classes, students can improve their market analysis scientificity by 37% and risk prediction ability by 42% through dynamic market decision-making training assisted by generative AI. Additionally, teachers can improve their ability to independently develop AI courses in economics by 65% through participating in AI scenario design workshops. Let economic backbone teachers and technical experts teach together to ensure that teachers are not learning "vague technology", but "practical teaching methods". Formally, we will conduct "workshops+school-based practice": in the workshops, we will design plans and discuss cases in groups. During practice, we will use the plans in the classroom, and then optimize them through research and review. The school will also provide "AI teaching innovation subsidies" to prevent teachers' extra efforts from being in vain. According to research data from a certain region, after adopting the "workshop+school-based practice" model, the classroom conversion rate of teachers' AI teaching programs has increased from 32% to 89%, and students' enthusiasm for participating in AI integrated courses has increased by 2.3 times compared to traditional classrooms.

We need to change the evaluation orientation even more. After a certain university increased the assessment weight of "AI teaching innovation achievements" to 15%, the proportion of teachers actively participating in AI teaching reform jumped from 18% to 62%, and the proportion of application materials related to AI innovation in professional title evaluation increased by 40%. This kind of "rewarding growth" has enabled teachers to move from "being able to operate" to "being able to innovate", just like Tianli International's AI teaching innovation subsidy policy. After the economic subject AI courses developed by teachers were promoted in counties, students' understanding accuracy of core concepts such as "supply-demand balance" increased by 58%, truly integrating AI technology into the temperature of teaching.

7. Conclusion

Following the cost-benefit theory of economic education, this article explores the synergistic relationship between the cost, benefits, and teacher innovation of AI technology in the field of economic education. The core conclusions are threefold: firstly, the cost of AI education presents a "clear implicit coexistence, high fixed low marginal contradiction", with rigid accounting expenditures and hidden opportunity costs jointly building pressure, and it is difficult to achieve economies of scale, resulting in difficult advantages; Secondly, the benefits of AI need to be viewed from the dual dimensions of "direct education+indirect economy". Teachers are the bridge, and their technological integration and innovation are the key to "input-output conversion"; Thirdly, teacher innovation faces "technological gaps, lack of incentives, and insufficient collaboration", which not only limits their own development but also hinders cost-effectiveness optimization. From the perspective of economic education, the introduction of AI into education is not about replacing teachers with technology, but about empowering the original intention of "imparting knowledge and skills" through technology. It needs to follow the logic of "cost optimization teacher empowerment benefit transformation". The "regional sharing+on-demand procurement", "teaching technology practice" integrated training, and "multi-party linkage" mechanism proposed in this article can provide reference for educational institutions and teachers. In the future, we can focus on the cost-effectiveness differences of AI in different stages of education, deeply integrate it with the core competencies of economic courses, and continue to educate people for the digital transformation of education.

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