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Research on the Construction Path of a New Ecosystem for AI Literacy Training of Teachers in Agricultural Universities

Xiaoting Sun, Shulin Zhao, Cunpeng Wang, Guangjie Lv

Network Information Management Office, Qingdao Agricultural University, Qingdao 266109, Shandong, China

Abstract: With the penetration of artificial intelligence (AI) technology in the agricultural field and the advancement of the educational digitalization strategy, the AI literacy of teachers in agricultural universities has become a core element supporting agricultural modernization and high-quality talent training. Based on a systematic analysis of the urgency and practical challenges of cultivating agricultural university teachers' AI literacy, this paper constructs a new cultivation ecosystem featuring "four-dimensional core + five-dimensional support", including four core training objectives (knowledge, skills, thinking, ethics) and a five-dimensional support system (curriculum, practice, faculty, culture, evaluation), supplemented by implementation guarantees in systems, resources, organizations, and technology. The research aims to provide theoretical reference and practical paths for solving the integration training dilemma of "agricultural science + AI", help improve teachers' AI literacy, and cultivate compound talents for rural revitalization and smart agricultural development.

Keywords: AI literacy; Teacher literacy cultivation; Educational digital transformation

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1. Introduction

Accelerating the development of a new generation of artificial intelligence has become an important national strategy for China to catch up with and lead the Fourth Industrial Revolution. The Report to the 20th National Congress of the Communist Party of China clearly points out that "education, science and technology, and talents are the basic and strategic supports for building a modern socialist country in an all-round way", and makes the major strategic deployment of "promoting educational digitalization and building a learning society and a learning power for lifelong learning for all". The Ministry of Education has launched the National Educational Digitalization Strategic Action to promote the transition and upgrading from "educational informatization" to "educational digitalization". The higher education system is the primary platform for talent training, and its reform direction must be closely aligned with national strategic goals. As the core subjects of educational activities, college teachers and students' AI literacy directly relates to the implementation effect of national

strategies.

2. Urgency and challenges of cultivating AI literacy among teachers and students in agricultural universities

"Literacy" is the organic unity of knowledge reserve, ability level, and values required for individuals to adapt to social development. The iteration of its connotation always resonates with technological changes and the evolution of social needs [1]. Artificial Intelligence Literacy (AI Literacy) is an independent literacy form formed after the explosion of generative AI technology, derived from information literacy and digital literacy. Its core is human-machine collaboration ability and ethical foresight awareness [2]. AI literacy not only requires people to have basic AI technical knowledge and application skills but also requires them to predict and evaluate the potential impacts of AI technology on future society, economy, and culture [3]. The cultivation of AI literacy among teachers and students in agricultural and forestry universities has entered a critical stage driven by the synergy of policies, industries, and educational transformation, becoming a core proposition supporting the development of China's agricultural modernization.

From the national strategic level, the rural revitalization strategy and agricultural modernization drive urgently need compound talents of "AI + agriculture". The 2025 Central No. 1 Document takes "developing new agricultural productive forces" as a key task; the National Smart Agriculture Action Plan (2024—2028) clearly proposes "supporting scientific research institutions to continuously promote the iterative innovation of smart agricultural technology models and lead the future development direction of smart agriculture" [4]. From the perspective of educational reform trends, the digital transformation of higher education requires college teachers to reshape teaching methods. The Education Power Construction Plan Outline (2024—2035), from the perspective of educational digital transformation, proposes "promoting artificial intelligence to assist educational reform. Formulate and improve digital literacy standards for teachers and students, and deepen the construction of teacher teams with the help of artificial intelligence", emphasizing that universities should build a long-term mechanism for digital literacy cultivation [5]; the Guiding Opinions of the Ministry of Education and Five Other Departments on Strengthening the Construction of Young Teacher Teams in Colleges and Universities in the New Era (2025) clearly states that it is necessary to "implement the digital empowerment teacher development action to enhance the ability to innovate teaching with digital intelligence technology" [6]. From the perspective of teachers and students' development, AI literacy has become the core competitiveness of individuals. For teachers, possessing AI literacy is the foundation for carrying out digital teaching, interdisciplinary scientific research, and producing high-level achievements. For students, AI literacy is a "hard currency" in the job market; enterprise recruitment data shows that graduates with agricultural AI application capabilities are more competitive in employment. In summary, universities must incorporate artificial intelligence literacy cultivation into the core system of talent training.

At the same time, the cultivation of AI literacy among teachers and students in agricultural universities also faces multi-dimensional and in-depth challenges, which restrict the quality and effect of AI literacy cultivation [7]. Specifically, they are manifested as: first, the insufficient adaptability of the curriculum and faculty system to the agricultural field. Most AI-related courses in agricultural and forestry universities are general education courses, lacking targeted content deeply integrated with agricultural scenarios, and there is a shortage of compound teacher resources with both agricultural professional background and AI technical capabilities; second, insufficient practice and resource supply. The coverage rate of practical operation platforms, such as university

smart agricultural demonstration parks and virtual simulation laboratories, is low, agricultural-related data is scattered, and there is a lack of standardized and large-scale agricultural datasets; third, the dual lack of balance in literacy cultivation and ethical cognition, with significant literacy gaps among different groups. Fourth, the industry-university-research collaborative talent training mechanism is immature, and there is a disconnect between university talent training and actual enterprise needs. University-enterprise cooperation mostly stays at the level of short-term lectures and internship visits, and teachers and students lack in-depth participation in smart agriculture-related industrial projects.

3. Research on the construction path of a new ecosystem for cultivating agricultural university teachers' AI literacy

Based on the characteristics and challenges of AI literacy cultivation in agricultural and forestry universities, combined with the core connotation of AI literacy, this paper explores the construction of a new ecosystem for teacher AI literacy cultivation featuring "four-dimensional core + five-dimensional support". With an integrated support system of curriculum, practice, faculty, culture, and evaluation, it promotes the comprehensive improvement of teachers' knowledge, skills, thinking, and ethical literacy in the AI field [8].

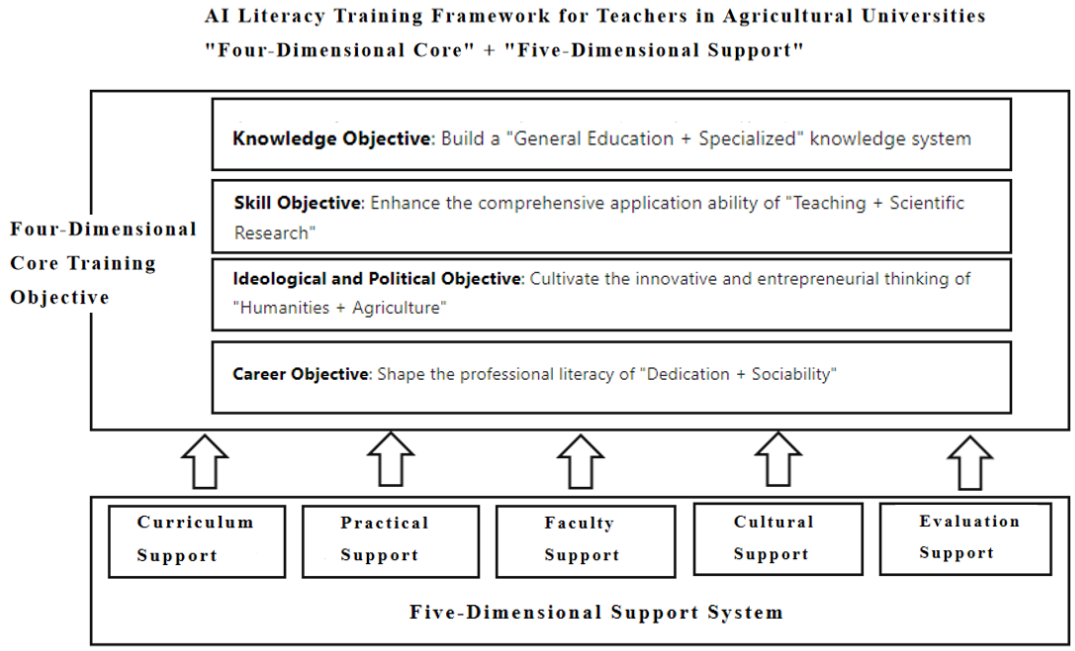

Figure 1. Framework diagram of AI literacy cultivation for teachers in agricultural universities.

3.1. Four-dimensional core training objectives of teachers' AI literacy

(1) Knowledge Objective: Construct a "general + professional" AI knowledge system

General knowledge includes basic theoretical knowledge such as the history of artificial intelligence, machine learning, and deep learning; professional knowledge focuses on AI application scenarios in the agricultural field, such as the principle of AI identification of crop diseases and insect pests, agricultural Internet of Things data analysis methods, and the architecture of intelligent breeding decision-making systems, ensuring that teachers master artificial intelligence knowledge related to agricultural teaching

and scientific research [9].

(2) Skill Objective: Improve the integrated application ability of "teaching + scientific research"

Teaching skills include proficient use of AI teaching platforms, production of agricultural virtual simulation course resources, and use of AI tools to assist learning situation analysis; scientific research skills include agricultural big data processing, agricultural-related AI algorithms, and interdisciplinary project collaboration, helping teachers integrate artificial intelligence technology into the entire process of teaching and scientific research.

(3) Thinking Objective: Form an innovative thinking mode of "AI technology + agricultural scenarios"

Cultivate teachers' teaching thinking of using AI logic to analyze teaching problems in agricultural majors and optimize teaching processes, as well as innovative thinking of exploring new directions in agricultural scientific research relying on AI technology. Strengthen teachers' cognition of the core value of teaching process data and agricultural data, and promote the systematic transition of teachers' teaching and scientific research thinking from "experience-driven" to "data-driven" [10].

(4) Ethical Objective: Abide by the professional bottom line of "safety + responsibility"

Cultivate teachers' digital ethics and safety awareness, strengthen the cultivation of teachers' digital moral and ethical awareness, network security protection awareness, intellectual property protection awareness, and awareness of the fair application of AI technology. Avoid negative impacts such as data leakage and rights infringement caused by the abuse of AI technology on agricultural teaching and scientific research activities and agricultural production practices. Guide teachers to use digital technology responsibly, manage digital resources, and protect data privacy, ensuring the synergy between technology application and ethical norms.

3.2. Five-dimensional support system

(1) Curriculum Support: Construct a three-gradient curriculum system of "general education + characteristic + expansion"

Guided by hierarchically empowering teachers' AI literacy improvement, a three-gradient curriculum system of "general education + characteristic + expansion" is constructed. Offer popular AI courses for all teachers to enrich their basic understanding of artificial intelligence, forming general education courses; offer characteristic agricultural AI courses for agricultural professional teachers to focus on improving their artificial intelligence technology capabilities for agricultural application scenarios, forming characteristic courses; promote teachers' follow-up learning of cutting-edge AI technologies through teacher training and academic lectures, forming expansion courses. Create a curriculum supply pattern covering basics, adapting to majors, and leading cutting-edge trends [11].

(2) Practice Support: Build a practice platform of "on-campus + off-campus + virtual"

Focusing on multi-dimensional scenario empowerment for teachers' AI application practice, a practice support system of "on-campus + off-campus + virtual" is constructed. Build on-campus agricultural AI laboratories and virtual simulation centers, focusing on basic practical training and providing scenarios for technical verification and ability improvement; establish off-campus practice bases in cooperation with AI enterprises and smart farms to introduce real application projects; build online AI teaching resource sharing platforms and AI intelligent assistants to provide case analysis and simulation operation opportunities. Form a collaborative support practice system covering basic training, industrial practice, and online simulation.

(3) Faculty Support: Implement a team-building model of "internal training + external introduction + collaboration"

Improve teachers' AI application capabilities through special AI technology training and teaching seminars on campus; introduce professional AI talents and hire enterprise technical experts to supplement faculty resources; at the same time, form interdisciplinary teams on campus to promote the collaborative development of agricultural professional teachers and information technology teachers, forming a multi-dimensional linkage faculty building pattern.

(4) Cultural Support: Create a campus atmosphere of "learning + innovation + sharing"

Regularly carry out AI-themed lectures, teaching innovation competitions, and teaching and scientific research salons to drive teachers to carry out AI learning and innovation; build AI learning communities to promote experience sharing and cooperative communication among teachers, forming a cultural pattern of mutual learning and progress, and creating a spiritual field and community supporting the construction of an AI teacher team [12].

(5) Evaluation Support: Establish a two-dimensional and multi-evaluation mechanism of "process + achievement"

Based on the scientific evaluation of teachers' AI literacy, a comprehensive evaluation system combining "process + achievement" is established. Incorporate AI teaching content, teaching reform, and students' literacy improvement into evaluation indicators, and conduct comprehensive and three-dimensional evaluations through various forms such as classroom observation, achievement display, and peer evaluation. Combine process evaluation and achievement evaluation to scientifically assess the effect of literacy improvement.

4. Implementation guarantees for the new ecosystem of AI literacy cultivation for teachers in agricultural universities

The effective implementation of the new ecosystem for AI literacy cultivation of teachers in agricultural and forestry universities relies on a multi-dimensional and systematic implementation guarantee system, which can work together from four aspects: systems, resources, organizations, and technology [13].

(1) System Guarantee

System guarantee is the core prerequisite for the implementation of the new ecosystem. Universities need to clarify the direction and implementation path of teachers' AI literacy cultivation through top-level design. First, formulate special implementation plans, clarify the goals, phased tasks, and division of responsibilities for teachers' AI literacy cultivation, and incorporate AI literacy cultivation into the key work of the university's "educational digital transformation". Each college formulates supporting implementation rules, forming a three-level promotion mechanism of "university coordination - college implementation - teacher participation"; second, improve the evaluation and incentive connection system, incorporate the evaluation results of teachers' AI literacy improvement into the core indicators of teachers' annual assessment, professional title evaluation, and selection of excellent teachers, and match incentive measures linked to the evaluation results. "Evaluate to encourage, encourage to improve", forming a two-way synergy of evaluation guiding direction and incentives improving effectiveness, ensuring the endogenous motivation and sustainability of teachers' AI literacy improvement.

(2) Organizational Guarantee

Construct an operational structure with clear powers and responsibilities and efficient collaboration to ensure the implementation of guarantee measures. Establish an on-campus interdisciplinary leading group to coordinate resource allocation, handle cross-departmental affairs, and solve difficulties and blockages in the implementation of the plan.

(3) Resource Guarantee

Balance "on-campus supply" and "off-campus collaboration" to provide material support and scenario supply. In terms of financial resources, set up a special fund for teachers' AI literacy cultivation, focusing on teacher training and funding for teachers' AI innovation projects. In terms of resource supply, build a "university-enterprise-local" resource collaborative ecosystem. Integrate resources from the School of Computer Science, Library, etc. on campus to develop AI teaching software and purchase or build agricultural datasets; cooperate with smart agricultural enterprises, local agricultural and rural bureaus, and Internet enterprises off-campus to build practice bases and jointly participate in local agricultural intelligence projects, providing teachers with a full-chain resource support from theory to practice [14].

(4) Technology Guarantee

Focus on "safety compliance" and "technology adaptability" to provide a stable technical environment. Build a technical safety guarantee system, standardize the collection, storage, and use of data to avoid data leakage; carry out teachers' AI technical safety training to strengthen network security awareness; establish a technology iteration mechanism, relying on external enterprise technical resources to iterate AI teaching tools and obtain cutting-edge agricultural AI technologies, ensuring that the supporting technology keeps pace with AI development trends, agricultural needs, and teaching needs.

In summary, the four-dimensional guarantee system not only provides "hard support" for the formation of the AI literacy cultivation new ecosystem but also ensures its "flexible adaptability" through a dynamic adjustment mechanism. Finally, it helps the cultivation ecosystem deepen from "construction and formation" to "efficient operation", and continuously promotes the improvement of teachers' AI literacy.

5. Conclusion

Under the dual background of the deep empowerment of artificial intelligence technology in agricultural modernization and the digital transformation of education, the cultivation of AI literacy of teachers in agricultural and forestry universities has become a key support for serving the national rural revitalization strategy and cultivating new agricultural productive forces. Based on the characteristics of agricultural universities and the development needs of teachers and students, this paper analyzes the urgency and prominent challenges of cultivating AI literacy of teachers in agricultural universities, constructs a new cultivation ecosystem with "knowledge, skills, thinking, ethics" as the four-dimensional core training objectives under the five-dimensional support of "curriculum, practice, faculty, culture, evaluation", and supplements implementation guarantees in systems, resources, organizations, and technology, forming a complete cultivation closed loop of "goal guidance - support empowerment - guarantee support" [15].

This new cultivation ecosystem closely meets the integration needs of "agricultural science + AI", providing an operable and replicable practical path for agricultural universities to improve teachers' AI literacy. In the future, agricultural universities need to continuously deepen the dynamic optimization of the cultivation ecosystem. On the one hand, focus on the frontier of agricultural AI technology and actual industrial needs to iterate curriculum content and practice scenarios; on the other hand, strengthen interdisciplinary collaboration and

in-depth integration of industry, university, and research to break resource barriers and talent shortages, promote teachers' AI literacy to jump from "basic mastery" to "innovative application", transport more compound talents for the development of smart agriculture, and help the high-quality development of higher agricultural education resonate with the construction of agricultural modernization.

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