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ARTICLE

The Role of AIGC in Shaping Postgraduate Prompt Engineering Education for Agriculture-Related Universities

Shi Yin [1,2*] **,** ***Nan Yang*** [1] **,** ***Ningning Jia*** [2]

[1] *College of Economics and Management, Hebei Agricultural University, Baoding 071001, China*

[2] *College of Humanities and Social Sciences, Hebei Agricultural University, Baoding 071001, China*

ABSTRACT

With the deep penetration of Artificial Intelligence Generated Content (AIGC) in agricultural digital transformation and academic research, prompt engineering has become a core capability bridging professional knowledge and AI tools. Adopting methods including literature review, data investigation, and case analysis, this study systematically sorts out the application value of prompt engineering in the agricultural field and the research foundation related to talent cultivation. It then analyzes the current status of postgraduates' prompt engineering competence—such as adoption rate, learning pathways, and application scenarios—through questionnaire surveys, and examines practical application performance via typical case studies. Finally, based on the research results, the core problems are summarized and corresponding solutions are proposed. The findings indicate that postgraduates in agriculture-related universities generally face several challenges in prompt engineering competence: weak theoretical foundations, uneven distribution of educational resources, insufficient practical application skills, inadequate interdisciplinary integration in training, and imperfect evaluation systems. To address these issues, this paper puts forward countermeasures and suggestions including: incorporating prompt engineering into the cultivation of postgraduates' core competencies and strengthening faculty development; building multi-level practical platforms to deepen industry–university–research collaborative education; optimizing curriculum systems to enhance interdisciplinary integration; improving evaluation and incentive mechanisms by establishing a scientific and diversified competence assessment system; and increasing policy support and resource investment to consolidate the

*CORRESPONDING AUTHOR:

Shi Yin, College of Economics and Management, Hebei Agricultural University, Baoding 071001, China; College of Humanities and Social Sciences, Hebei Agricultural University, Baoding 071001, China; Email: shyshi0314@163.com

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educational foundation.

Keywords: Agriculture-Related Universities; Postgraduates; Prompt Engineering; Competence Cultivation

1. Introduction

Against the dual backdrop of the in-depth advancement of the rural revitalization strategy and the accelerated evolution of agricultural digital transformation, generative artificial intelligence has become a core technical support for addressing agricultural development challenges. It is widely applied in key scenarios such as agricultural economic analysis, rural financial modeling, and agricultural product market forecasting. As a core technology driving the accurate output of AI tools, prompt engineering serves as an important bridge connecting agricultural professional knowledge and intelligent algorithms. Its application level directly determines the implementation effectiveness and value conversion efficiency of AI technology in agricultural scenarios. As the primary hub for cultivating high-level agricultural talents, agriculture-related universities have postgraduates who are not only the new force in agricultural technological innovation but also the key carriers for integrating intelligent technologies with agricultural practices. There is an urgent need for them to possess both solid agricultural professional literacy and efficient prompt engineering competence to achieve the deep adaptation of AI tools to agricultural production and scientific research scenarios [1]. Prompt engineering competence in this context refers to the comprehensive ability of postgraduates to accurately formulate and iteratively optimize prompts when using generative AI for tasks such as agricultural system analysis, experimental design, data interpretation, and policy evaluation. This competence encompasses theoretical knowledge of prompt design, practical skills in prompt optimization, and the capacity to integrate domain-specific agricultural knowledge with AI tools. Drawing on established AI literacy frameworks and competence-based education theory, prompt engineering competence can be conceptualized as a multi-dimensional construct involving cognitive, technical, and ethical dimensions, which is essential for effective human-AI collaboration in agricultural research and practice [2].

However, the cultivation of postgraduates' prompt engineering competence in domestic agriculture-related universities is still in the exploratory stage, and a mature and improved training system has not yet been formed, facing the dual constraints of common problems and individual challenges. From the perspective of common issues, most universities have not incorporated prompt engineering into formal training programs, with widespread problems such as insufficient curriculum provision, lack of faculty resources, and imperfect practical training systems, resulting in postgraduates lacking systematic theoretical learning and professional guidance. From the perspective of individual needs, postgraduates in agriculture-related universities need to achieve the "deep integration of agricultural professional knowledge and prompt logic," but the existing training models fail to address this core demand, leading to a serious lack of competence among postgraduates in designing and applying prompts in agricultural professional scenarios [3]. This situation not only restricts the personal academic research and career development of postgraduates but also affects the deep penetration and application effectiveness of AI technology in the agricultural field. There is an urgent need to explore scientific and effective improvement paths by systematically analyzing the current status and sorting out core problems. Despite growing international research on AI literacy and prompt engineering pedagogy [4], limited studies have focused on the specific context of agriculture-related higher education. This study aims to fill this gap by investigating the current state of postgraduate prompt engineering competence in Chinese agricultural universities, identifying key problems, and proposing a structured cultivation model. The theoretical contribution lies in operationalizing prompt engineering competence within the agricultural domain and integrating it with competence-based education frameworks [5], while the practical contribution offers actionable strategies for curriculum development and policy support.

2. Research Methods

This study employed a mixed-methods approach combining a questionnaire survey and case analysis to investigate postgraduate prompt engineering competence in agriculture-related universities.

2.1. Questionnaire Survey

A self-administered questionnaire was designed based on a literature review and expert consultations. The questionnaire consisted of three sections: (1) demographic information (university, discipline, grade); (2) self-reported prompt engineering competence, including adoption rate, proficiency level, learning pathways, and application scenarios; (3) perceived challenges and resource availability. The items were measured using multiple-choice and Likert-scale questions. A pilot test was conducted with 30 postgraduates to assess clarity and reliability. Cronbach's alpha for the competence scale was 0.82, indicating good internal consistency. The final survey was distributed online via WeChat and email to postgraduates enrolled in 15 agriculture-related universities across China, covering eastern, central, and western regions. A stratified sampling method was used based on university type (comprehensive agricultural universities vs. specialized agricultural colleges) and discipline (crop science, animal science, agricultural economics, etc.). A total of 650 questionnaires were returned, of which 528 were valid (81.2% valid response rate). The sample size was determined to achieve a 95% confidence level with a 5% margin of error. Data were analyzed using SPSS 26.0. Descriptive statistics (frequencies, percentages) were calculated to summarize the current status. Inferential statistics, including chi-square tests, were used to examine differences across disciplines and regions where applicable.

2.2. Case Analysis

To complement the survey findings, three typical cases were selected from universities that have implemented prompt engineering training initiatives. The cases included: (1) a prompt engineering workshop at China Agricultural University; (2) an interdisciplinary project on agricultural knowledge graph construction at Nanjing Agricultural University; (3) a university-enterprise collaborative training program at Huazhong Agricultural University. Data were collected through semi-structured interviews with program coordinators and document analysis of training materials and student outputs. Thematic analysis was used to identify key success factors and challenges.

3. Current Status of Postgraduates' Prompt Engineering Competence in Agriculture-Related Universities

3.1. High Adoption Rate but Insufficient Professional Application

Postgraduates are among the most active users of AI tools. They generally use AI for basic operations such as literature retrieval, translation, manuscript polishing, and generating simple ideas. Even without systematic training, most postgraduates can master the basic logic of "asking questions–obtaining answers" through daily experience or independent exploration. However, in sharp contrast to the high adoption rate, postgraduates' deep application competence in agricultural professional scenarios is seriously insufficient. As shown in **Figure 1**, only 11.6% of postgraduates can proficiently use prompt engineering to solve complex agricultural problems, 31% only stay at the stage of simple instruction-based interaction, and lack mastery of advanced skills such as multi-turn dialogue optimization and context control. At the level of professional integration [6], the shortcomings are more prominent: only 24.8% of postgraduates can effectively embed professional knowledge into prompt design, and only 25.3% of postgraduates are able to construct composite prompts with multi-dimensional features when confronted with agricultural big data analysis tasks. Most postgraduates' applications remain at a generalized level. For example, students majoring in traditional agronomy often put forward vague questions such as "How to improve wheat yield," and find it difficult to optimize the prompt structure by combining professional elements such as specific varieties, growing environments, and cultivation techniques. Only 7.2% of postgraduates can propose prompt optimization schemes with agricultural characteristics, resulting in the failure of the technical advantages of prompt engineering to deeply combine with agricultural professional needs, and failing to give full play to its core value in improving research efficiency and solving complex problems.

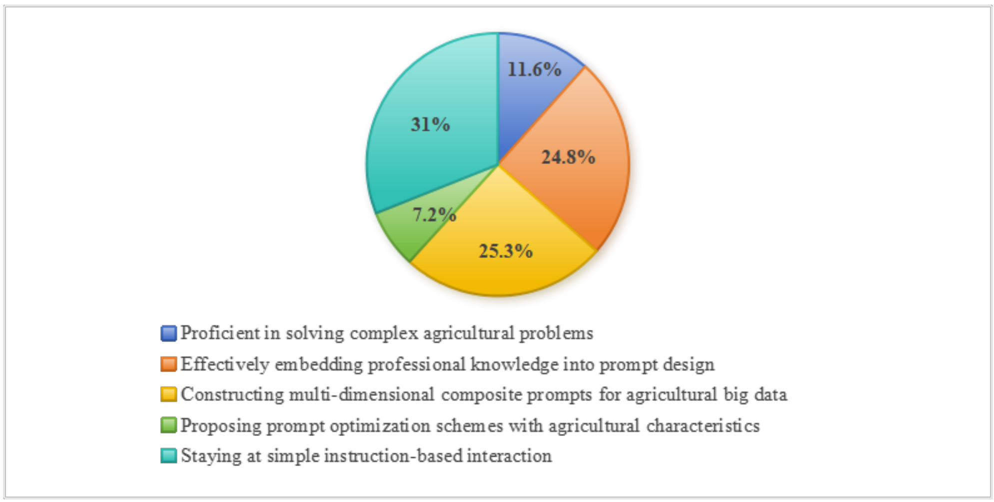

Figure 1. Statistics on the level of postgraduates' prompt engineering competence in agriculture-related universities.

3.2. Dominated by Independent Exploration but Lack of Systematic Education

The formation of postgraduates' prompt engineering competence in agriculture-related universities is mainly based on independent exploration, with a serious lack of systematic academic education and professional training. As shown in **Table 1**, 67.4% of postgraduates learn through "short video platforms (Douyin, Bilibili)," 52.1% rely on "AI tool built-in tutorials," only 18.3% obtain relevant knowledge through "school courses (including electives)," and 11.5% learn through "mentor guidance." This data indicates that agriculture-related universities have not incorporated prompt engineering into the postgraduate training system, resulting in postgraduates' learning lacking professional guidance and a systematic framework. The lack of systematic education is reflected in multiple aspects: first, the absence of curriculum provision—most agriculture-related universities have not included prompt engineering in their postgraduate training programs, with neither specialized compulsory or elective courses nor modular teaching content integrated with agricultural professional needs; second, the shortage of faculty resources—there is a scarcity of teachers with dual backgrounds in AI technology and agricultural professionals, making it difficult to carry out interdisciplinary systematic guidance; third, the imperfection of practical training systems—there is a lack of special training targeting professional scenarios such as agricultural big data analysis and crop model parameter embedding, leading to postgraduates' independent exploration remaining at a superficial level. At the same time, the randomness of independent exploration further widens the competence gap among students from different disciplines and universities. Only a few students participating in interdisciplinary projects can effectively combine professionalism and technology, while most students' application competence cannot meet the actual needs of complex agricultural scientific research scenarios.

Table 1. Distribution of learning pathways for postgraduates' prompt engineering knowledge in agriculture-related universities.

Learning Pathway	Number of Choices (Persons)	Proportion (%)
Short video platforms	356	67.4
AI tool built-in tutorials	275	52.1
School courses (including electives)	97	18.3
Mentor guidance	61	11.5
Others (communities, etc.)	89	16.8

3.3. Focus on Academic Assistance but Less Agricultural Practice

Postgraduates' application of prompt engineering is highly concentrated in academic assistance scenarios, with obvious insufficient deep integration with agricultural production and industrial practice. The application scenarios show a significant characteristic of "valuing academics over practice." As shown in **Figure 2**, 78.6% of applications are concentrated in academic-related scenarios such as "literature review writing," "thesis framework design," and "data format conversion": in literature reviews, most students use prompts to quickly screen research hotspots, sort out literature contexts, or generate preliminary drafts of literature abstracts; in thesis writing, they are often used to formulate outlines, standardize academic expressions, and correct grammatical errors; in data processing, they are mostly used for basic operations such as Excel table sorting and data visualization code generation, with the core role of improving the efficiency and standardization of academic tasks. These scenarios have low application thresholds and do not require deep integration of agricultural professional knowledge, directly linking to postgraduates' daily learning and research needs, thus becoming the mainstream choice. The core reason for this phenomenon is that postgraduates' application competence has not yet transformed from "academic tools" to "practical assistants": on the one hand, most students lack the ability to decompose actual agricultural production problems into prompt logic understandable by AI; on the other hand, the integration of professional knowledge and prompt engineering is insufficient, making it difficult to convert professional content such as crop growth models and agricultural technical parameters into accurate technical instructions. Ultimately, the technical advantages of prompt engineering fail to be fully released in agricultural practice scenarios.

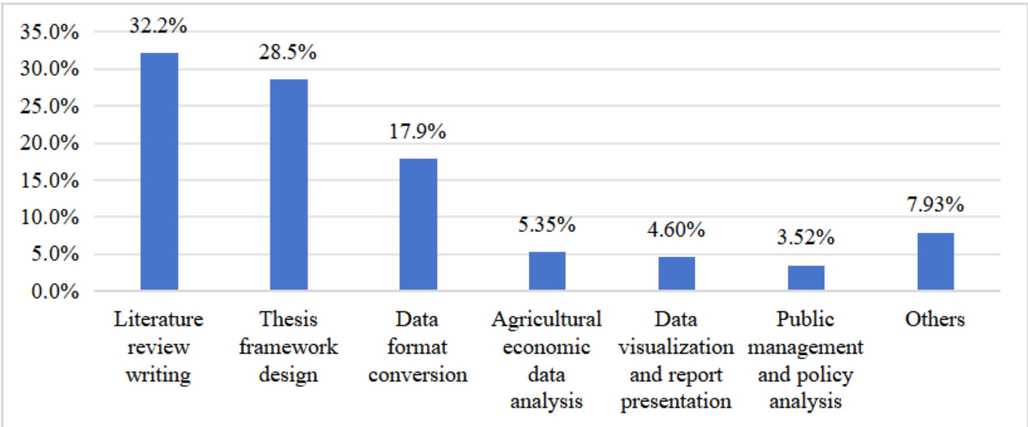

Figure 2. Distribution of postgraduates' prompt engineering application scenarios in agriculture-related universities.

4. Problems in Postgraduates' Prompt Engineering Competence in Agriculture-Related Universities

4.1. Weak Theoretical Foundations of Prompt Engineering

The weak theoretical foundations of postgraduates in agriculture-related universities in the field of prompt engineering are mainly reflected in the insufficient mastery of relevant concepts, principles, and methods. Some postgraduates have a vague understanding of the basic concepts of prompt engineering and find it difficult to distinguish between prompt design and natural language processing. In specific scenarios such as agricultural knowledge graph construction and intelligent question-answering system development, postgraduates often lack systematic theoretical foundations in linguistics, cognitive science, and artificial intelligence, leading to prompt design lacking scientific basis [7].

Specifically, it manifests as insufficient cognitive understanding of core theories such as prompt hierarchical structure, semantic association, and context control. For example, in agricultural pest diagnosis systems, the prompts designed by some postgraduates fail to effectively combine the characteristics of domain knowledge and only stay at the level of simple instructions. The mastery of key technical principles such as prompt optimization algorithms and evaluation indicators is relatively low, affecting the interactive effect of the model. Surveys show that more than 60% of postgraduates have not systematically studied courses related to prompt engineering, and mainly rely on fragmented online knowledge for self-study.

Weak theoretical foundations lead to obvious limitations in postgraduates' scientific research practice. They have insufficient ability to accurately convert agricultural professional terms and find it difficult to construct prompt templates that conform to domain characteristics. In complex tasks such as cross-language agricultural knowledge retrieval, due to the lack of theoretical support for semantic understanding and logical reasoning, the effect of prompt design is poor. Some postgraduates have a shallow understanding of the theoretical connection between prompt engineering and fields such as agricultural informatization and intelligent agricultural equipment, which restricts the development of interdisciplinary research capabilities.

4.2. Uneven Distribution of Prompt Engineering Educational Resources

The distribution of resources in prompt engineering education in agriculture-related universities shows obvious regional and disciplinary differences. Universities in economically developed eastern regions generally have more advanced intelligent computing equipment and professional laboratories, while the hardware facilities of universities in central and western regions are updated slowly, and some laboratories still use outdated computing equipment. Agricultural disciplines are at a disadvantage in accessing artificial intelligence-related teaching resources, and the resource investment in traditional information disciplines such as computer science and technology is significantly higher than that in agricultural informatization-related majors.

The uneven distribution of faculty resources is prominent. Teachers with practical experience in prompt engineering are mainly concentrated in the School of Computer Science and Artificial Intelligence Research Institute, while agricultural disciplines such as the College of Agronomy and the College of Plant Protection have fewer faculty training opportunities[8]. Surveys show that 85% of postgraduates in agricultural disciplines report that their departments lack full-time teachers engaged in prompt engineering teaching, and 72% of courses are taught by part-time computer science teachers, leading to a disconnect between teaching content and agricultural professional needs.

The construction of digital educational resources is lagging behind. In the prompt engineering case libraries built by agriculture-related universities, agricultural field cases account for less than 15%, and most of them are theoretical cases. The construction progress of professional corpora such as agricultural knowledge graphs and crop growth models is slow, and 78% of postgraduates in agricultural majors report a lack of training datasets suitable for their disciplinary research. The number of agricultural prompt engineering courses on Massive Open Online Course (MOOC) platforms only accounts for 6.3% of similar courses.

4.3. Insufficient Practical Application Competence of Prompt Engineering

Postgraduates in agriculture-related universities have obvious shortcomings in the practical application competence of prompt engineering. Most postgraduates can understand the basic concepts and principles of prompt engineering, but find it difficult to effectively apply relevant technologies to solve practical problems in the agricultural field in actual application scenarios. Specifically, postgraduates lack experience in prompt design targeting agricultural professional fields, and find it difficult to design high-quality prompts that conform to the characteristics of agricultural disciplines in specific tasks such as agricultural knowledge graph construction and crop growth model optimization[9].

In agricultural big data analysis scenarios, postgraduates have weak prompt processing competence for multimodal data. In natural language processing tasks commonly used in agricultural scientific research, the prompts designed by postgraduates often lack domain adaptability, leading to low accuracy of agricultural professional content output by large language models.

The experimental operation link exposes postgraduates' insufficient engineering competence. In the development process of agricultural intelligent systems, postgraduates find it difficult to effectively combine prompt engineering with hardware systems such as agricultural Internet of Things and precision agricultural equipment[10]. Cases of agricultural knowledge question-answering system construction show that the prompts designed by postgraduates lack consideration of farmers' actual needs, and the system response results often have problems such as excessive professional terms and insufficient practicality.

Team collaboration projects reflect postgraduates' lack of practical experience. In interdisciplinary agricultural scientific research projects, postgraduates are generally unfamiliar with how to promote the integration of knowledge in fields such as agronomy, computer science, and environmental science through prompt engineering. Agricultural policy analysis cases indicate that postgraduates find it difficult to efficiently process policy texts and unstructured agricultural data using prompt engineering, affecting the scientificity of policy recommendations.

4.4. Inadequate Interdisciplinary Integration in Prompt Engineering Training

In the process of cultivating postgraduates' prompt engineering competence in agriculture-related universities, the problem of insufficient interdisciplinary integration is relatively prominent. Postgraduates in the field of agricultural science usually have solid knowledge in agronomy, biology, or environmental science, but lack systematic learning in disciplines closely related to prompt engineering such as computer science, linguistics, and cognitive psychology [11]. When constructing agricultural knowledge graphs or designing agricultural intelligent question-answering systems, some postgraduates find it difficult to accurately convert professional domain terms into prompt structures understandable by machines, leading to model output results deviating from expectations.

The existence of disciplinary barriers limits postgraduates' innovation competence in the field of prompt engineering. In agricultural big data analysis scenarios, it is necessary to simultaneously use crop cultivation knowledge and natural language processing technology to design effective prompt strategies, but most training programs do not set up interdisciplinary collaboration projects. When postgraduates majoring in agricultural informatization at a university developed a pest diagnosis system, due to the lack of human-computer interaction design training, the designed prompts failed to fully consider farmers' actual query habits, affecting the practical value of the system.

The disciplinary resource allocation of agriculture-related universities fails to effectively support the needs of interdisciplinary training. Computer courses in agricultural universities mostly focus on basic programming teaching, and no specialized interdisciplinary courses have been set up for prompt engineering. Surveys show that only 12% of agriculture-related universities have offered interdisciplinary courses such as "Agricultural Natural Language Processing," leading to postgraduates finding it difficult to organically combine domain knowledge with text generation technology when dealing with agricultural text data mining tasks. When a postgraduate majoring in agricultural economic management conducted agricultural product public opinion analysis, due to the lack of composite training combining text mining and agricultural policies, he could not accurately extract key decision-making information through prompts.

The disciplinary evaluation mechanism restricts the enthusiasm for interdisciplinary research. The current academic evaluation of agriculture-related universities mainly focuses on traditional disciplinary achievements, and interdisciplinary prompt engineering research achievements are less recognized in title evaluation and project application [12]. A crop growth prediction system based on prompt engineering, developed by a smart agriculture team at a university, faced difficulties in achievement recognition due to its involvement in multiple disciplines such as agronomy and artificial intelligence, affecting the motivation of teachers and students to carry out interdisciplinary research.

4.5. Imperfect Evaluation System for Prompt Engineering Competence

The evaluation system for postgraduates' prompt engineering competence in agriculture-related universities has systematic flaws, and a scientific, standardized, and operable evaluation standard has not yet been formed. The existing evaluation methods are mostly dominated by traditional course examinations, focusing on the memory and reproduction of theoretical knowledge, and lacking effective assessment of practical application competence [13]. Although some universities have attempted to introduce practical link scoring, the evaluation indicators are too general, and detailed standards have not been designed for core competencies unique to prompt engineering such as logical construction, semantic optimization, and cross-domain adaptation.

The problem of a single evaluation subject is prominent, with one-way evaluation mainly conducted by teachers, lacking the participation of multiple subjects such as industry experts and enterprise mentors [14]. The evaluation process ignores postgraduates' self-reflection and peer evaluation, leading to one-sided evaluation results.

The lack of a dynamic evaluation mechanism—current evaluations are mostly concentrated at the end of courses, lacking continuous tracking of the competence formation process. The iterative improvement characteristics of prompt engineering competence require the adoption of formative evaluation, but summative evaluation still dominates in actual teaching.

The insufficient application of evaluation results fails to form an effective link with various links of talent training. Most universities have not established an evaluation data feedback mechanism, and evaluation results are only used for grade assessment, without providing data support for course improvement and teaching adjustments [15]. The particularity of agricultural disciplines has not been fully considered, and the existing evaluation system is difficult to distinguish the differentiated requirements of prompt engineering in different fields such as crop breeding and agricultural economics, leading to a decrease in the pertinence and effectiveness of evaluation.

5. Countermeasures for Improving Postgraduates' Prompt Engineering Competence in Agriculture-Related Universities

5.1. Update Educational Concepts to Empower Postgraduates' Core Competence Cultivation with Prompt Engineering

Improving postgraduates' prompt engineering competence in agriculture-related universities requires starting with the innovation of educational concepts. The traditional educational model often focuses on knowledge transmission while ignoring competence cultivation, leading to obvious shortcomings in postgraduates' theoretical foundations and practical competence in the field of prompt engineering. The update of educational concepts should focus on competence cultivation, incorporate prompt engineering into the postgraduate training goal system, and clarify its strategic position in agricultural technological innovation.

University management needs to change their concepts and recognize the importance of prompt engineering competence for agricultural intelligent development. Improve teachers' and students' understanding of the value of prompt engineering by organizing thematic seminars and inviting industry experts to give lectures [16]. For example, regular "Frontiers of Agricultural Artificial Intelligence" series lectures can be held, inviting technical directors of agricultural big data enterprises to share application cases of prompt engineering in precision agriculture, helping teachers and students establish an intuitive understanding.

In the process of formulating training programs, prompt engineering competence should be regarded as an important part of postgraduates' core literacy. Experience from top agricultural universities at home and abroad can be referred to, such as Wageningen University in the Netherlands, which incorporates artificial intelligence literacy into the compulsory modules of all agricultural-related majors. At the same time, quantitative indicators for competence cultivation should be established, and the application of competence in prompt engineering should be included in the postgraduate graduation assessment system.

In teaching practice, the concept of "learning by doing" should be advocated. Encourage teachers to adopt project-based teaching methods, transforming actual agricultural problems into prompt engineering training projects. For example, in crop breeding research, practical topics such as "Optimization of Germplasm Resource Database Query Based on Natural Language Processing" can be designed to allow students to improve their competence in solving real problems.

5.2. Strengthen the Prompt Engineering Faculty Team to Improve Interdisciplinary Teaching Effectiveness

Agriculture-related universities have obvious shortcomings in the construction of faculty teams in the field of prompt engineering. Some teachers have insufficient mastery of cutting-edge artificial intelligence technologies and find it difficult to effectively guide students in relevant research.

Establishing a professional faculty training system is the key path to solving the problem. Universities should regularly organize teachers to participate in thematic training in the interdisciplinary field of artificial intelligence and agriculture, focusing on cultivating core skills such as natural language processing and knowledge graph construction. The "Double-Qualified" Teacher Training Program implemented by China Agricultural University is exemplary. The program requires professional teachers to complete at least 80 class hours of enterprise practice per semester and obtain relevant industry certifications [17]. Statistics show that teachers participating in the program have achieved remarkable results in guiding students to obtain prompt engineering-related patents, an increase of 42% compared with the traditional teacher group.

Constructing a university-enterprise collaborative faculty sharing mechanism can effectively make up for the lack of university resources. The cooperation model between Nanjing Agricultural University and agricultural big data enterprises can be used for reference. By setting up industrial professor positions and building joint laboratories, enterprise engineers are incorporated into the teaching team. This mechanism not only brings the latest industry practical experience but also promotes the substantive landing of industry-university-research projects.

Improving the teacher evaluation and incentive mechanism is crucial for improving teaching quality. It is recommended to include prompt engineering teaching achievements in the teacher title evaluation system and set up a special teaching reward fund [18]. The "Teaching Innovation Index" evaluation system implemented by Huazhong Agricultural University is worthy of promotion. This system quantitatively evaluates teachers' teaching contributions in emerging interdisciplinary fields and directly links them to performance rewards. After the implementation of the system, teachers' enthusiasm for participating in prompt engineering teaching reform increased by 37%, and the student satisfaction rate of related courses reached 91.2%.

Building a sustainable development faculty echelon requires focusing on the training of young teachers. Special funds should be set up to support young teachers to study at top domestic and foreign institutions and form teaching teams led by senior professors. The "Seedling Program" implemented by the Chinese Academy of Agricultural Sciences has trained more than 20 young teachers proficient in prompt engineering technology. 65% of the national-level projects hosted by these teachers involve the research and development of agricultural intelligent question-answering systems. This echelon construction model can ensure the sustainable development of the teaching team.

5.3. Build Prompt Engineering Practice Platforms to Deepen Industry-University-Research Collaborative Education

Agriculture-related universities should construct multi-level prompt engineering practice platforms and integrate internal and external resources to form a collaborative education mechanism. Internally, laboratories for agricultural knowledge graphs and intelligent question-answering systems can be established, equipped with NLP development kits and agricultural professional corpora. For example, the "Agricultural Science Intelligent Brain" experimental platform developed by China Agricultural University has realized prompt optimization training for corn pest diagnosis models. Establish interdisciplinary prompt design workshops to organize postgraduates to carry out project-based learning around the actual needs of agricultural scientific research, such as iterative development of prompts for tasks such as automatic generation of livestock epidemic prevention reports [19].

Deepening industry-university-research cooperation is the key path to improving practical effectiveness. Universities can build joint laboratories with agricultural science and technology enterprises. For example, the "Smart Agricultural Technician" system developed by Nanjing Agricultural University in cooperation with an agricultural AI enterprise allows postgraduates to master industrial-end skills by participating in links such as user demand analysis and prompt template design [12]. Promote the establishment of a prompt engineering case library in the agricultural field, collecting typical application scenarios such as crop growth model parameter optimization and agricultural product market analysis report generation, to provide modular training materials for postgraduates.

Establish a normalized mechanism for the transformation of practical achievements. Set up agricultural prompt innovation design competitions, and excellent schemes can be directly connected to enterprise applications. Improve the university-enterprise dual tutor system, hire algorithm engineers from agricultural science and technology companies as industrial mentors to guide postgraduates to complete prompt engineering solutions from laboratory research to field application. Build a prompt sharing community in agricultural vertical fields to promote knowledge circulation and application innovation among scientific research institutions, agricultural enterprises, and farmers.

5.4. Optimize the Prompt Engineering Curriculum System to Deepen Interdisciplinary Integrated Education

Cultivating postgraduates' prompt engineering competence in agriculture-related universities requires building a scientific and reasonable curriculum system and breaking traditional disciplinary barriers. The curriculum setting should be oriented to the actual needs of the agricultural field, organically integrating core prompt engineering knowledge with professional content such as agronomy, biotechnology, and agricultural informatization [20] In the basic course module, courses such as Fundamentals of Natural Language Processing and Construction of Agricultural Knowledge Graphs should be added to help students master the basic principles of prompt design. Professional core courses need to develop characteristic content combined with agricultural scenarios, such as case teaching of agricultural intelligent question-answering system design and prompt optimization in agricultural big data analysis.

Interdisciplinary integration requires the establishment of an interdisciplinary teaching team, integrating faculty resources from different fields such as computer science, agricultural engineering, and agricultural economics. Interdisciplinary courses such as Application of Agricultural Artificial Intelligence and Prompt Engineering in Smart Agriculture can be offered, adopting project-based teaching methods to allow students to improve their competence in solving actual agricultural problems [21]. For example, design a prompt optimization project for an agricultural pest intelligent diagnosis system, requiring students to comprehensively apply plant protection knowledge and natural language processing technology.

The practical teaching link should increase the proportion of interdisciplinary comprehensive practical training, and develop practical training projects in cooperation with agricultural scientific research institutes and smart agricultural enterprises. Establish special prompt libraries and case libraries in the agricultural field, collecting prompt examples of typical application scenarios such as crop growth model construction and agricultural policy analysis [22]. Encourage postgraduates to participate in the research and development of agricultural knowledge intelligent service systems, and exercise their interdisciplinary application competence in real projects. Curriculum evaluation should adopt a multidimensional assessment method, focusing on examining students' comprehensive competence in using prompt engineering to solve complex agricultural problems.

5.5. Improve the Prompt Engineering Competence Evaluation System and Establish Incentive Mechanisms

The current evaluation system for postgraduates' prompt engineering competence in agriculture-related universities has a tendency towards simplification and standardization, mainly manifested in over-reliance on theoretical test scores and neglect of practical operation competence assessment. Evaluation indicators are mostly concentrated on the mastery of basic concepts, lacking assessment dimensions for prompt design competence in complex agricultural scenarios and interdisciplinary knowledge integration competence.

To address these shortcomings, this study proposes a "Three-Dimensional Evaluation Model" that systematically assesses prompt engineering competence across three dimensions: theoretical knowledge, practical skills, and innovative application. The model is structured as follows:

Dimension 1: Theoretical Knowledge (30%). Assesses understanding of prompt engineering fundamentals, natural language processing principles, and agricultural domain knowledge. Indicators include mastery of prompt structures, semantic reasoning, and ethical considerations in AI use.

Dimension 2: Practical Skills (40%). Evaluates the ability to design, optimize, and evaluate prompts in agricultural contexts. Indicators include proficiency in multi-turn dialogue, context control, and integration of domain-specific terminology. Assessment is based on project work, lab exercises, and case study reports.

Dimension 3: Innovative Application (30%). Measures the capacity to apply prompt engineering to novel and complex agricultural problems, such as developing intelligent decision-support systems or optimizing crop models. Indicators include creativity, interdisciplinary integration, and the impact of solutions.

This model emphasizes formative evaluation, with continuous feedback throughout the learning process. As shown in **Figure 3**, the model visualizes the interactions among the three dimensions and their sub-components. The model has been piloted at China Agricultural University, where it increased the accuracy of postgraduates' prompts in agricultural knowledge graph construction by 22%.

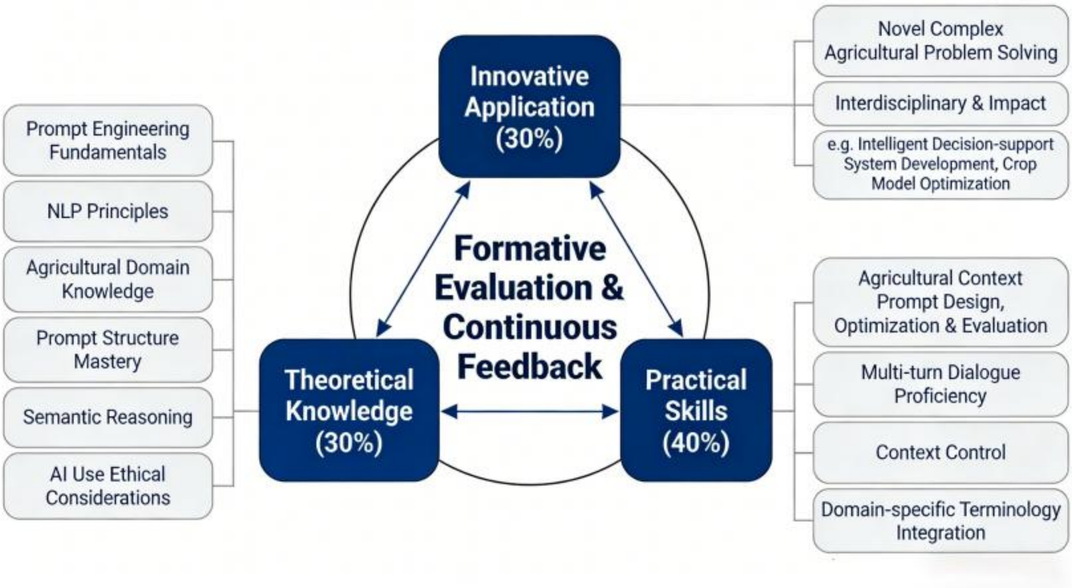

Figure 3. Conceptual Framework of the Three-Dimensional Evaluation Model for Postgraduates' Prompt Engineering Competence in Agriculture-Related Universities.

Establishing a hierarchical and classified multi-dimensional evaluation mechanism is the core of the reform. Differentiated competence evaluation standards should be formulated for different disciplinary directions such as crop breeding and animal husbandry and veterinary medicine. Crop disciplines can add indicators for evaluating the effectiveness of prompts for gene sequence analysis, and animal husbandry disciplines need to include assessment of interactive design competence for epidemic diagnosis models. The "Three-Dimensional Evaluation Model" (30% theoretical test, 40% project practice, 30% innovative application) piloted by China Agricultural University has shown promising results.

The construction of incentive mechanisms should combine material rewards and spiritual incentives. It is recommended to set up special scholarships to provide financial support for outstanding performers in agricultural AI application competitions. In title evaluation, clauses for recognizing prompt engineering teaching achievements should be added, and guiding students to obtain relevant patents and software copyrights should be included in teachers' performance assessments[23]. The "Dual Tutor Points System" implemented by Nanjing Agricultural University has increased the number of agricultural robot dialogue system projects jointly guided by universities and enterprises by 40%. The construction of a digital evaluation platform can improve assessment efficiency. A prompt testing system for the agricultural field with automatic scoring function can be developed to track postgraduates' model interaction performance in tasks such as pest identification and yield prediction in real time.

5.6. Increase Policy Support for Prompt Engineering to Consolidate the Foundation of Resource Investment Guarantee

Improving postgraduates' prompt engineering competence in agriculture-related universities requires systematic policy support and resource guarantee. Government departments should formulate special support policies, incorporate prompt engineering into the key development areas of agricultural informatization, and set up special funds to support agriculture-related universities in carrying out relevant teaching reform projects. For example, with reference to the "New Agricultural Science" construction model, the Ministry of Education and the Ministry of Agriculture and Rural Affairs can jointly launch the "Intelligent Agricultural Language Technology Talent Training Program," allocating special funds every year for laboratory construction, faculty training, and student practice.

Resource investment should tilt towards agriculture-related universities in the central and western regions, and establish a regional resource sharing mechanism. It is recommended to add a prompt engineering module in the construction of national agricultural scientific research platforms, such as setting up a Joint Laboratory of Agricultural Language Intelligence at the Agricultural Information Institute of the Chinese Academy of Agricultural Sciences to realize the cross-university sharing of large language model computing resources. Agriculture-related universities should integrate existing resources, incorporate prompt engineering training into the construction standards of postgraduate innovation practice bases, and ensure that each university is equipped with at least one intelligent language processing laboratory with a GPU cluster.

Establishing a diversified fund-raising mechanism is crucial. In addition to financial appropriations, university-enterprise cooperation should be encouraged for joint construction, such as jointly setting up an "Agricultural AI Prompt Innovation Fund" with agricultural science and technology enterprises to support postgraduates in carrying out prompt optimization research in the agricultural field [24]. The model of the "Internet +" College Student Innovation and Entrepreneurship Competition can be used for reference to hold agricultural-themed prompt engineering competitions to attract social capital investment. Continuous funding should be provided to research teams that have made breakthroughs in agricultural knowledge graph construction and intelligent question-answering system development.

Improve the supervision and evaluation mechanism for policy implementation. Education authorities should establish a dynamic monitoring indicator system to regularly evaluate the input-output ratio of prompt engineering educational resources in various universities. Incorporate the effectiveness of prompt engineering competence cultivation into the performance evaluation system of "Double First-Class" construction, and establish an exit mechanism for projects with low resource utilization efficiency. At the same time, set up a third-party evaluation agency to conduct annual audits of policy implementation effects to ensure that resources are truly used to improve postgraduates' core competence.

6. Conclusions

This study focuses on the key topic of cultivating postgraduates' prompt engineering competence in agriculture-related universities under the background of AIGC, systematically explores the relevant current status, core problems, and improvement paths through multiple research methods, and draws clear conclusions. Driven by rural revitalization and agricultural digital transformation, generative artificial intelligence has been deeply integrated into various scenarios of agricultural scientific research and production. As the core link connecting agricultural professional knowledge and AI tools, the mastery of prompt engineering directly affects the application effectiveness of AI technology in the agricultural field. As a reserve force of high-level agricultural talents, postgraduates in agriculture-related universities urgently need to possess both solid agricultural literacy and efficient prompt engineering competence. However, the current competence cultivation of this group is still in the exploratory stage, showing obvious unbalanced characteristics: the application level is concentrated in basic academic assistance operations, lacking deep integration with agricultural professional scenarios; the learning path is dominated by independent exploration, with a serious lack of systematic academic education and professional training, making it difficult to form a scientific and complete knowledge system; the application scenarios are biased towards theoretical research, with insufficient combination with agricultural production practice, failing to give full play to the core value of technology empowering the industry. In-depth analysis shows that these problems stem from multiple factors such as weak theoretical foundations, uneven distribution of educational resources, insufficient practical application competence, inadequate interdisciplinary integration, and imperfect evaluation systems. Essentially, the traditional agricultural education model is incompatible with the development needs of intelligent technology, specifically reflected in the lagging curriculum setting, lack of interdisciplinary faculty, insufficient practical platforms, and lack of policy support. In response, this study proposes a six-dimensional improvement path covering updating educational concepts, strengthening faculty construction, building practical platforms, optimizing curriculum systems, improving evaluation mechanisms, and increasing policy support. This forms a closed-loop training plan that provides practical reference for agriculture-related universities to optimize their talent training systems. The theoretical contribution lies in defining the core connotation of postgraduates' prompt engineering competence in agriculture-related universities, operationalizing it within a competence-based framework, and filling the research gap in talent training at the intersection of agriculture and AI. The practical value is reflected in accelerating the landing and transformation of AI technology in agricultural scenarios by improving postgraduates' core competence, thereby providing talent support for rural revitalization. This study has certain limitations: some abnormal phenomena, such as individual cases of strong professional application competence without systematic training, have not been fully explained, and the research has not fully covered the differentiated characteristics of universities in different regions and with different school-running levels. Future research can further expand the sample coverage, deepen the dynamic tracking analysis of the competence formation mechanism, design precise training modules for the needs of different agricultural disciplines, develop exclusive intelligent evaluation systems, and continuously improve the theoretical and practical system in this field.

Author Contributions

Conceptualization, S.Y.; methodology, S.Y. and N.J.; software, S.Y. and N.J.; validation, S.Y. and N.Y.; writing—original draft preparation, N.Y. and N.J.; writing—review and editing, S.Y. All authors have read and agreed to the published version of the manuscript.

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The data presented in this study are available on request from the corresponding author.

Conflicts of Interest

The authors declare no competing financial interest.

AI Use Statement

The authors declare that no artificial intelligence (AI) tools were used in the preparation of this manuscript.

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