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Research on the Ecosystem of Digital Intelligence-Enabled Undergraduate Thesis Management under the Background of Teacher Education Accreditation

Zhangling Wu
Sichuan Minzu College, Luding, Sichuan, China

Abstract: **Under the backdrop of the vigorous development of digital intelligence technology and the in-depth advancement of teacher education accreditation, the management of undergraduate theses is confronted with numerous dilemmas in traditional models, such as outdated and impractical thesis topics, insufficient data processing capabilities, frequent academic misconduct, inefficient processes, and fragmented resources. To address these issues, this paper proposes integrating digital intelligence technology into the thesis management process based on the teacher education accreditation concepts of "student-centered, outcome-oriented, and continuous improvement". It aims to build a collaborative and symbiotic management ecosystem involving multiple subjects through approaches such as constructing a "practice-oriented" topic selection and guidance system, upgrading an integrated management platform, and integrating diverse data resources. This ecological optimization can not only improve the quality of undergraduate theses and promote the modernization of higher education, but also facilitate the precise alignment between teacher training in normal majors and the needs of basic education. It provides practical support for the "continuous improvement" requirement of teacher education accreditation and offers practical references for the digital and intelligent transformation of university thesis management.**

Keywords: **Teacher Education Accreditation; Digital Intelligence Empowerment; Undergraduate Thesis; Management Ecosystem**

1. Introduction

In December 2020, the Ministry of Education issued the "Measures for Sampling Inspection of Undergraduate Graduation Theses / Designs (Trial)", and launched the sampling inspection work for undergraduate graduation theses / designs. In 2023, the national sampling inspection of undergraduate graduation theses / designs was officially launched to further strengthen and improve educational supervision, evaluation and monitoring [1]. Nowadays, the vigorous rise of digital intelligence technology is like a surging wave, sweeping through every corner of society and injecting a steady stream of new momentum into the development of various industries. The field of higher education is also in the midst of this wave of digital transformation, facing unprecedented opportunities and challenges. As a core link in higher education to test students' professional abilities, the scientific nature of the management ecology of graduation theses directly affects the quality of talent training. With the massive growth of educational data and the increasing complexity of educational scenarios, the traditional management model is gradually showing its inadequacy, and many problems are gradually emerging. Undergraduate graduation thesis / design is a key link in undergraduate education and teaching in colleges and universities. It is an important way to cultivate students' ability to comprehensively apply the theoretical knowledge and practical skills they have learned to solve practical problems, and also an important means to test students' comprehensive quality and professional ability [2]. Its importance is self-evident. However, in the current practice of graduation thesis management, problems emerge one after another. From the perspective of the topic selection stage, some students lack a keen insight into the forefront of the discipline. The selected topics are outdated and broad, disconnected from practical applications, and it is difficult to demonstrate academic value and practical significance. During the research process, the

data collection methods were single, the analysis methods were simple and crude, and it was impossible to explore the essence of the problem in depth, resulting in a serious lack of research depth. In the writing stage, the format specifications are chaotic, the content logic is loose, the expression is vague, and there are even a large number of academic misconducts such as AI patchwork, which seriously violate the principles of academic integrity. At the level of supervisors, the insufficient number of teachers leads to the dispersion of guidance energy. Some teachers have outdated knowledge structures and are unable to provide students with cutting-edge and targeted guidance. At the management level, the processes are cumbersome and slow, the connection between various links is not smooth, information communication is blocked, and monitoring is weak, making it impossible to find and solve problems in a timely manner. Against this background, integrating digital intelligence technology into graduation thesis management and building an ecosystem supported by digital intelligence technology, covering the participation of teachers, students, management departments and other parties, and realizing the coordinated development of all links of graduation thesis management has become an urgent need to solve the current predicament. This not only helps to improve the quality of graduation theses and ensure the realization of talent training goals, but also is a key step in promoting the modernization of higher education.

2. Core Requirements of Teacher Education Accreditation for Undergraduate Graduation Theses

Teacher education accreditation adheres to the core concepts of "student-centered, outcome-oriented, and continuous improvement". Against the background of digital intelligence, targeted requirements have been put forward for undergraduate graduation theses, which form the underlying logic for optimizing the management ecology.

First, the outcome-oriented quality standards emphasize that graduation theses should reflect normal university students' practical abilities in education and teaching. They need to be combined with basic education scenarios (such as teaching design, classroom observation, educational surveys, etc.), and the results should have practical application value rather than being purely theoretical research. The innovative requirements of the teacher education accreditation system for graduation thesis management essentially represent a paradigm shift from single academic evaluation to multi-dimensional ability certification. The traditional management model focuses on the formal compliance and academic standardization of theses, while the teacher education accreditation standards, through the principle of "reverse design", decompose graduation requirements into measurable ability indicators, forcing the reconstruction of the thesis management mechanism. This transformation is reflected in three cognitive leaps: the evaluation dimension expands from academic output to teaching transformation ability; the quality monitoring nodes move forward from the terminal to the entire process; and the guidance model shifts from individual tutor experience to a standardized collaborative system.

Second, for process-oriented quality monitoring, it is required to establish a management mechanism with full-process traceability, covering such links as topic selection, proposal, guidance, and evaluation. It is necessary to record key nodes such as teacher-student interactions, revision processes, and practical feedback to ensure the consistency between training objectives and graduation requirements. The establishment of the "continuous improvement" mechanism in the accreditation standards makes it necessary for thesis management to build a closed-loop feedback system, which provides an institutional interface for the involvement of digital intelligence technology. The theoretical legitimacy of digital intelligence empowerment stems from the unique contradictory tensions in teacher education accreditation. When the accreditation standards require graduation theses to reflect a complete closed loop of "teaching design and implementation - evaluation and reflection - continuous improvement", the traditional manual management model faces three conflicts: the contradiction between the fragmentation of normal university students' teaching practice data and the systematic evidence required for accreditation; the gap between the subjectivity of qualitative evaluation and the objective demands of accreditation standards; and the mismatch between static management processes and dynamic improvement requirements. The "data -

algorithm - feedback" trinity framework proposed by intelligent education theory just constructs a translation path to solve these conflicts - realizing the visualization of abilities through the dataization of teaching behaviors, completing the objectification of evaluation with the help of learning analysis algorithms, and simulating the teaching improvement process using digital twin technology. The construction of the theoretical framework needs to complete the conceptual grafting of educational standards and technical logic. The "student-centered" principle emphasized by teacher education accreditation is transformed into the construction dimension of learners' digital portraits in the digital intelligence environment; the "outcome orientation" requirement is mapped to the predictive analysis function of the thesis management system. This translation is not a simple correspondence, but has undergone a re-interpretation of educational ontology: when teaching ability is deconstructed into quantifiable data features, the immutability of blockchain technology just meets the accreditation's requirements for the authenticity of evidence, and the time series analysis ability of machine learning resonates methodologically with the growth-oriented evaluation concerned by accreditation. This interdisciplinary theoretical integration ultimately points to a new accreditation paradigm based on digital trust, whose core is to establish a digital evidence chain for the development of normal university students' professional abilities.

3. Definition of Core Concepts of Digital Intelligence-Enabled Graduation Thesis Management Ecology

Digital intelligence-enabled management refers to a dynamic process in which digital and intelligent technologies such as big data, artificial intelligence, and cloud computing are deeply integrated into management practices. Through the integration of technology and management elements, it realizes management model innovation, process optimization, and efficiency improvement. In the scenario of undergraduate graduation thesis management, its core connotation is reflected in three dimensions: First, empowerment at the technical tool level. That is, by means of digital intelligence tools such as intelligent management platforms, data analysis software, and academic resource recommendation systems, the temporal and spatial limitations of traditional management are broken, enabling digital circulation and intelligent processing of links such as thesis topic selection, guidance, and evaluation. Second, empowerment at the subject capability level. It aims to improve teachers' and students' ability to use digital tools through training in digital intelligence literacy and practical application. Third, empowerment at the ecological collaboration level. Relying on digital intelligence technology, a collaborative network of multiple subjects is built to integrate scattered academic resources, management data, and subject behavior information, forming a collaborative and symbiotic management ecology involving "students-teachers-management departments". This realizes optimized resource allocation, real-time information sharing, and full-process dynamic monitoring, ultimately enhancing the scientificity and efficiency of graduation thesis management.

Graduation thesis management covers a series of closely linked links, including topic selection and conception, proposal demonstration, research implementation, thesis writing, and defense evaluation. In the stage of topic selection and conception, students need to explore research topics with academic value by integrating professional knowledge, personal interests, and social needs. During the proposal demonstration, students should elaborate on the background, significance, and research methods of the selected topic to supervisors and experts, and accept rigorous review and guidance. In the research implementation phase, scientific research methods are used to collect and analyze data, so as to conduct in-depth exploration into the essence of the problem. In the process of thesis writing, students should abide by academic norms and present their research results clearly and accurately. At the defense evaluation stage, students respond to experts' questions, demonstrate the depth and breadth of their research, and undergo a comprehensive inspection and evaluation. These links are interdependent and progressive, jointly forming a complete chain of graduation thesis management.

The concept of management ecology originates from ecosystem theory. Introducing it into the field of graduation thesis management aims to build an integrated whole where multiple subjects coexist harmoniously, elements flow

smoothly, and dynamic balance is maintained. In this ecosystem, colleges and universities, as core organizers, assume key responsibilities such as formulating rules, providing resources, and coordinating various parties. Teachers, like wise guides, rely on their profound professional knowledge and rich experience to answer questions and guide students on their research path. In the context of digital intelligence, teachers have transformed from instructors to digital intelligence managers. They need to proficiently use the integrated digital intelligence platform for thesis management to conduct online management of links such as topic selection review, proposal defense, mid-term inspection, and defense evaluation, so as to realize process traceability and data retrievability. Students are energetic explorers who, under the guidance of their supervisors, give full play to their subjective initiative and delve deeply into academic issues. Students need to deeply integrate digital intelligence technology into their thesis research. On one hand, they need to integrate multi-modal information such as behavioral data (e.g., click trajectories on learning platforms) and text data (e.g., teacher feedback). On the other hand, students need to extract educational laws from the data, critically analyze the applicable boundaries of digital intelligence technology in their theses, use plagiarism checking tools and AI detection tools to ensure the originality of theses, and provide technical detection reports in the appendix. Educational management departments are like macro-regulators, ensuring the healthy and orderly operation of the management ecology at the policy level. Technical support teams, like unsung heroes, inject strong impetus into the entire ecosystem and provide solid technical support by applying advanced digital intelligence technologies. Through the interaction and sharing of elements such as information, resources, and knowledge among various subjects, a close collaborative relationship is formed, which jointly promotes the prosperous development of the graduation thesis management ecology.

4. Problems Existing in Current Undergraduate Graduation Thesis Management (Analysis from the Perspective of Digital Intelligence)

“Graduation thesis / design is an important part of the talent training plan in colleges and universities, and the quality of the school's talent training and teaching level is largely reflected in the quality of the graduation thesis / design.”[3] However, against the current background of digital intelligence, there are many problems in the management of undergraduate graduation theses, and several prominent ones are listed below.

4.1 Lack of Digital Intelligence Literacy, Endangering Thesis Quality

Teachers and students have uneven digital literacy and insufficient mastery of emerging technologies, making it difficult for them to skillfully use online tools and thesis management software. Normal university students are weak in conducting research using educational big data, and supervisors make inadequate use of resources such as "digital intelligent teaching case databases" and "online teaching research platforms", failing to meet the accreditation requirements for "integration of information technology with education and teaching". "As instructors, teachers' own professional literacy and teaching attitude directly affect the quality of students' graduation theses." [4] Students lack the ability to use information technology in academic fields for literature retrieval, data analysis, and thesis typesetting. Faced with massive academic resources, they do not know how to screen and identify them, which affects the depth and breadth of thesis research. Academic misconduct persists despite repeated prohibitions, having already become a serious problem eroding the foundation of academic integrity. Influenced by utilitarian trends, some students attempt to take shortcuts: they plagiarize others' research results during thesis writing, patch together content from the Internet, and misappropriate others' intellectual achievements; or they falsify experimental data and engage in fraud to make research results conform to preset expectations, deviating from the essential requirements of the scientific spirit. Although universities have introduced thesis plagiarism checking systems in an attempt to build a barrier against academic misconduct, these systems have certain limitations. For example, they are ineffective in identifying hidden plagiarism methods such as rewriting and patchworking, making it difficult to fundamentally eliminate such behaviors. The formalization of quality monitoring is severe, rendering the monitoring links superficial and

failing to exert substantial effects.

4.2 Dispersed Management Processes and Low Management Efficiency

The existing graduation thesis management processes are characterized by cumbersomeness and dispersion, covering numerous links such as topic selection, proposal, writing and revision, evaluation, and defense. In each link, students have to ask their supervisors and deans to sign on paper documents before submitting them for archiving. The process is fragmented and lengthy, which greatly restricts management efficiency. Under the traditional graduation thesis management mode, key links like topic selection, proposal, writing, and defense are like isolated islands, lacking close and effective connection. Information transmission is delayed, and progress control is weak, resulting in poor operation and low efficiency of the entire management process. In the topic selection stage, students often lack systematic academic guidance and accurate information support. They determine topics based on their limited knowledge reserves and vague interest orientations, which easily leads to problems such as overly broad, outdated topics or topics that are divorced from professional practice. The proposal stage, as an important link connecting topic selection and research implementation, should clarify the direction and plan the path for subsequent research through rigorous demonstration and review. However, in reality, there are problems such as the perfunctory review of proposal reports and lax checks by supervisors, resulting in many defects in some proposal reports, such as unclear research purposes, unreasonable research methods, and ambiguous technical routes, which hidden dangers for subsequent research. In the writing stage, due to the lack of timely and effective guidance and standardized constraints, students often fall into the mire of chaotic formatting, empty content, and loose logic. On the one hand, some supervisors have poor communication with students, failing to timely understand students' writing progress and difficulties, and thus cannot provide targeted writing suggestions. On the other hand, students themselves have insufficient mastery of academic norms and thesis writing skills, with many irregularities in literature citation, data analysis, and argumentation, which seriously affect the quality of the thesis. The defense stage should be a comprehensive inspection and wonderful display of students' graduation thesis achievements. However, due to the accumulation of problems in previous links, embarrassing situations frequently occur during the defense, such as students being unfamiliar with the content of their theses, answering questions vaguely, and judges asking shallow questions. Moreover, judges find it difficult to comprehensively and accurately evaluate the quality of students' theses within limited time, which greatly reduces the quality control function of the defense stage.

4.3 Insufficient Resource Integration and Difficulties in Digital Intelligence Collaboration

Currently, academic resources are distributed in a fragmented manner. There is a lack of a unified integration mechanism for library databases, department-specific materials, online open resources, etc. Students have to switch between multiple platforms, resulting in high costs for information acquisition. The linkage between digital intelligence tools and management platforms is insufficient, and resources such as data analysis software and intelligent review systems have not formed a synergistic effect, making it difficult to support the improvement of students' research depth and thesis quality. The integration of resources is inadequate, and the phenomenon of resource fragmentation is severe. Under the existing graduation thesis management model, the available resources can hardly converge into a strong force to promote the high-quality completion of graduation theses. Various types of professional literature, academic databases, and excellent thesis examples are often scattered in multiple places such as school libraries, department reference rooms, various websites, and teachers' personal collections. When looking for required materials, students have to rush between different places and systems, consuming a lot of time and energy. They also often miss key materials due to poor information flow, which affects the depth and breadth of thesis research. Resources such as educational literature databases, excellent teaching plan case libraries, and basic education policy documents are scattered and have not formed a special resource pool for normal university students, making it difficult for students' research to connect with real educational scenarios. In the past, resources for graduation thesis creation

were like a scattered sand, spread everywhere without effective integration. Although the school library has a rich collection, retrieval is inconvenient. Students search for literature like looking for a needle in a haystack, which is time-consuming and laborious. The access to academic databases is restricted, making it difficult to reach high-quality cutting-edge materials, resulting in lagging knowledge updates. Teachers mostly keep their research materials and teaching courseware for their own use, and no sharing platform has been built, making it difficult to inherit experience and wisdom, and leading new teachers and students to repeat the process of exploration. Interdisciplinary resources are even more isolated. Knowledge in liberal arts, sciences, and engineering is clearly divided, which hinders integrated innovation and restricts the expansion of students' horizons and the diversified exploration of theses. The introduction of off-campus practice bases and industry dynamic information is weak, leading to the disconnection between theses and reality. The drawbacks of "discussing strategies on paper" are widespread, with no way to transform and apply theories, resulting in double losses in academic value and practical significance.

5. Optimization Paths for the Ecosystem of Undergraduate Thesis Management Empowered by Digital Intelligence in the Context of Normal University Accreditation

5.1 Enhancing Teachers' and Students' Digital Intelligence Literacy to Ensure Thesis Quality

Cultivating teachers' and students' digital intelligence literacy, enabling them to accurately identify problems, promptly warn of risks, and ensure high-quality undergraduate theses, plays a pivotal role in improving management efficiency. Teachers should proactively embrace digital intelligence tools and skillfully integrate them into the entire process of thesis guidance. "Undergraduate thesis writing requires students to deeply understand their professional knowledge and organically combine it with practice, emphasizing both theoretical innovation and practical application."[5] Students need to develop digital intelligence learning and creative thinking: master information retrieval skills to accurately screen authoritative and cutting-edge academic materials, building a solid knowledge reserve; and proficiently use data analysis tools to extract valuable information from massive datasets, thereby enhancing their academic literacy and innovative capabilities to meet the challenges of thesis writing with a new mindset. "In the era of digital intelligence, precise goal orientation and strong task motivation in higher education practice are important conditions for students' intelligent learning. Therefore, educators need to respect, understand, and inspire learners, enabling them to fully develop their potential. This means that higher education in the digital intelligence era should continue to emphasize and adhere to the 'student-centered' philosophy, keeping students as the main body of education and teaching."[6,7] To establish a digital intelligence management mindset, it is necessary to break the constraints of traditional management models, drive decision-making with data, abandon subjective assumptions and empiricism, and identify pain points and difficulties in management through accurate data analysis. This allows for the formulation of scientific, reasonable, and targeted management strategies. With a forward-looking perspective, institutions should actively introduce cutting-edge digital technologies to build intelligent management platforms, providing teachers and students with a convenient and efficient service environment, and leading thesis management work to a new level through innovation.

5.2 Upgrading the Integrated Management Platform to Optimize the Thesis Management Ecosystem

Nowadays, many universities are exploring the establishment of digital platforms for undergraduate thesis management to realize real-time interaction and data sharing in links such as teacher guidance, student submission, and review feedback. However, their data analysis and management processes still need further optimization. Upgrading the integrated thesis management platform is a core measure empowered by digital intelligence. It can break the information barriers between various links under the existing management model, effectively integrate scattered resources and processes, realize automated and intelligent control of the management ecosystem, inject new vitality into the undergraduate thesis management ecosystem, and promote a leapfrog

improvement in management efficiency and quality. At the same time, it should connect with external open academic resource platforms and authoritative websites in professional fields to broaden academic horizons [8]. Tedious procedures should be simplified, such as abolishing paper-based signature links. By introducing intelligent technologies and collaborative concepts, the thesis management process can be intelligently reshaped. Mobile terminals can be used to implement intelligent push throughout the management process, ensuring accurate access to key information. Improving and integrating the integrated undergraduate thesis management ecosystem is a key support for realizing digital intelligence transformation. This ecosystem should take covering the entire thesis management process as a basic requirement, with seamless connection between links including topic selection application, proposal review, writing guidance, mid-term inspection, review and defense, and grade filing, forming a closely linked management closed loop. This closed loop should be migrated to the integrated platform, where electronic signatures are used instead of paper-based signatures, and AI tools are utilized to automatically verify thesis formats, saving process time. Meanwhile, a fully functional mobile application should be developed: students can use it to access literature, record writing inspirations, and communicate with supervisors anytime and anywhere. Supervisors can conveniently revise theses, provide feedback, and keep track of students' progress in real time via mobile terminals. Administrators can also approve processes and view data reports through mobile phones at any time. This breaks the constraints of time and space, truly realizing the digitization, intelligence, and mobility of undergraduate thesis management, and comprehensively improving management efficiency.

5.3 Integrating Diversified Data Resources to Empower Thesis Writing and Management with Digital Intelligence

Integrating diversified data resources injects a fresh "water source" into the thesis management ecosystem, drives the precise operation of all links, stimulates new vitality, and realizes the leap from extensive management to refined and intelligent control. First, data collection and integration. Faced with complex and diverse data, in accordance with the principles of accuracy, completeness, and consistency, erroneous, duplicate, and incomplete data should be identified and eliminated to ensure that every piece of data is true and reliable, laying a solid foundation for subsequent analysis. Second, data-based precise services. Relying on the integrated treasure trove of data resources, comprehensive and personalized precise services can be provided to teachers and students. For example, supervisors can grasp real-time dynamic data such as students' thesis progress, material review, and preliminary research feedback through the platform to accurately identify students' writing difficulties. If it is found that students' literature review analysis is superficial, high-quality review samples and in-depth analysis of academic material retrieval and study skills can be pushed in a targeted manner; for students' weak links in data analysis, professional statistical software tutorials and data processing cases of similar studies can be intelligently recommended to achieve personalized guidance and help students break through bottlenecks. By integrating core educational databases, teaching plans of local prestigious schools, basic education policy databases, etc., an intelligent recommendation function can be developed to accurately push survey tools and data analysis models for topics such as "local education research". Evaluation indicators cover practical relevance, depth of reflection, and application value; by aligning thesis quality data with certification indicators, the platform generates rectification reports to drive process optimization. In this way, it can be tailored to meet the needs of teachers and students, and comprehensively improve the quality of undergraduate theses and management efficiency. Through integrating resources from all parties, the goal is to effectively enhance thesis quality. In the process of optimizing the undergraduate thesis management ecosystem, digital intelligence technology is used for resource integration to provide a solid material foundation and knowledge source for thesis creation and management. At the level of academic databases, schools should integrate authoritative academic resources at home and abroad, such as CNKI, Wanfang, and other well-known databases, to ensure that teachers and students can conveniently access massive academic literature, including journal papers, dissertations, conference papers, academic

reports, etc., covering cutting-edge research results in various disciplines. This helps students establish academic norms, understand thesis writing skills, learn literature citation, data analysis, argumentation, and elaboration, and ultimately improve the quality of their theses.

6. Conclusion

The optimization of the thesis management ecosystem under the background of normal university accreditation should take "practice orientation" as the core and digital intelligence technology as the support. Through goal reconstruction, process reengineering, resource integration, and mechanism innovation, it aims to realize the closed-loop connection of "training quality - thesis achievements - accreditation standards". This process can not only enhance the educational value of undergraduate theses but also promote the precise alignment between the training of normal professional talents and the needs of basic education, providing specific means to meet the "continuous improvement" requirement of accreditation. This study takes undergraduate theses as the carrier and explores the optimization of the thesis management ecosystem from the perspective of multi-dimensional and integrated management. Through concept innovation, platform optimization, and all-round resource integration, it injects vigorous vitality into the thesis management ecosystem, empowering teachers and students to forge ahead on the academic path. Starting from the predicament of traditional models, it reveals long-standing problems in processes, collaboration, resources, and quality assurance; draws experiences in technology integration, process optimization, and resource integration from cases of universities at home and abroad; and then proposes reshaping strategies such as building intelligent platforms, reengineering agile processes, and establishing knowledge resource databases, as well as innovative measures in teaching, evaluation, and incentive mechanisms. Meanwhile, it accurately identifies existing problems at the levels of technology, teachers, students, and management mechanisms, and puts forward targeted optimization strategies covering technology empowerment, teacher development, student training, and management innovation. Practice has verified that these strategies play a significant role in promoting teaching quality, student development, and university brand building, highlighting the key significance of digital transformation for the innovation of the thesis management ecosystem and providing strong support for the modernization of university education management.

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