

An Optimization Path for "Supervisor-Counselor" Collaborative Education in Universities Empowered by Large Language Models

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Abstract: The deep integration of large language model (LLM) technology offers a transformative opportunity to break the long-standing zero-sum game dilemma in graduate "supervisor-counselor" collaborative education. This paper proposes a value orientation grounded in the concepts of "precision, synergy, integration, and symbiosis," and guided by the practical principles of "technological support, multi-stakeholder cooperation, resource sharing, and dynamic adjustment," to construct an optimized path system for university "supervisor-counselor" collaborative education in the context of LLMs. On this basis, it proposes reshaping a positive-sum game pattern featuring the deep integration of "academic and ideological-political education" under a fourfold guarantee of institution, platform, capability, and culture, thus providing an operable practical scheme for enhancing the management and service capacity of graduate education.

Keywords: Large language models, supervisor-counselor collaboration, precision education, human-machine symbiosis, positive-sum game.

1. Introduction

Graduate education stands at the apex of the national education system and constitutes a critical link in cultivating top-tier innovative talents. In an era marked by the continuous expansion of graduate enrollment and increasingly diverse cultivation needs, the effectiveness of collaborative education between supervisors and counselors has become increasingly prominent [1]. Prior empirical investigations indicate that conceptual gaming, responsibility gaming, and evaluation gaming constitute three fundamental obstacles restricting "supervisor-counselor" collaboration from progressing from mere formality to substantive cooperation [2, 3]. The breakthroughs in generative artificial intelligence represented by large language models such as ChatGPT and Deepseek provide unprecedented technological leverage for overcoming these obstacles [4]. However, technological empowerment does not inherently bring about systemic optimization; it must be embedded within a scientific conceptual framework and institutional design. Moving from "problem diagnosis" to "countermeasure construction," this paper proposes a four-dimensional optimization path for LLM-empowered "supervisor-counselor" collaborative education, complemented by institutional, capability, and cultural guarantee systems, aiming to explore a replicable and scalable pathway for enhancing the management and service capacity of graduate education.

2. Concept Reconstruction: From a Zero-Sum Game to a Positive-Sum Symbiosis

The logical starting point of the optimization path lies in the renewal of educational concepts. In response to the goal conflicts, boundary ambiguity, and standard discrepancies revealed in prior research, this study proposes a four-

dimensional conceptual framework of "precision – synergy – integration – symbiosis," laying a value foundation for the subsequent path design.

2.1. The Precision Concept: From "Experience-Driven" to "Data-Driven"

Traditional "supervisor-counselor" collaboration relies heavily on personal experience and incidental communication, resulting in lagging and crude identification of student needs. The precision concept demands taking students' authentic developmental needs as both the starting point and the endpoint, and leveraging the multi-source data analysis capability of LLMs to achieve precise identification of individual developmental states, precise classification of needs, and precise delivery of interventions [7, 8]. This represents not merely a technological upgrade, but a paradigm shift in educational thinking from "broad irrigation" to "precise drip irrigation."

2.2. The Synergy Concept: From "Fighting Alone" to "Systematic Operation"

Synergetics reveals that the overall effectiveness of a system depends on the degree of nonlinear coupling among its subsystems [9]. In the field of graduate education, "supervisor-counselor" collaboration is not a simple summation of the supervisor's work and the counselor's work, but an educational resultant force formed by the two entities centering on the holistic development of students. The synergy concept emphasizes that supervisors and counselors should abandon the mindset of "two wheels turning independently" and instead view themselves as organic components of the same educational system, achieving complementary advantages in both positioning and supply functions [10].

2.3. The Integration Concept: From "Academic-Ideological Dichotomy" to "Integrative Cultivation of Virtue and Scholarship"

The long-standing dichotomy of "student affairs offices managing ideology and supervisors managing academic affairs" is the epistemological root of collaborative failure. The integration concept demands breaking the artificial division between "academic" and "ideological-political" education, organically integrating ideal and belief education, academic ethics cultivation, and mental health care throughout the entire academic guidance process, making scientific research training itself a vehicle for value guidance and achieving a deep fusion of "cultivating both virtue and scholarship." Zhang Jia et al. also emphasized that the essence of collaborative education lies not in the refinement of labor division but in the depth of integration [1].

2.4. The Symbiosis Concept: From "Human-Machine Replacement Anxiety" to "Bidirectional Empowerment Ecology"

Drawing on human-machine symbiosis theory, this study proposes positioning the LLM as an "intelligent node" in the collaborative network, rather than a "substitute." Supervisors, counselors, and artificial intelligence each contribute their strengths and co-evolve: humans undertake tasks requiring value judgment, emotional empathy, and creative decision-making, while LLMs are responsible for data aggregation, pattern recognition, and solution generation. Within this symbiotic ecology, supervisors and counselors shift from "fearing replacement by technology" to "extending their own capabilities through technology," forming a positive cycle of bidirectional human-machine empowerment.

3. Path Construction: A Four-Dimensional Collaborative Optimization Scheme Driven by LLMs

Guided by the above concepts, this paper constructs a "four-precision" technological path for LLM-empowered "supervisor-counselor" collaborative education, forming a closed-loop system of "depiction – matching – sharing – analysis."

3.1. Precise Depiction: Data Integration and Multi-Dimensional Portrait Construction

Data silos are the fundamental technological root of "supervisor-counselor" collaborative dysfunction. The primary task of the optimization path is to build a "Graduate Student Development Data Middle Platform," which, under strict desensitization and user authorization, integrates academic data from the educational administration system, behavioral data from the student affairs system, output data from the research management system, assessment data from the mental health center, and career development data from the employment guidance system. Leveraging the multi-modal fusion and feature extraction capabilities of LLMs, a dynamically updated "Student Multi-Dimensional Development Portrait" is generated across four dimensions: the academic development index, the psychological resilience coefficient, the career orientation profile, and the social

competence matrix. For the first time, supervisors and counselors can "see" the same student on a single data landscape, moving collaboration from "the blind men and the elephant" to "panoramic perspective." For instance, when the system detects a continuous decline in a graduate student's academic data accompanied by fluctuations in mental health data, the portrait automatically labels it as a "Comprehensive Risk Alert," prompting supervisors and counselors to share information from their respective perspectives and form a collaborative assessment.

3.2. Precise Matching: Intelligent Engine and Collaborative Task Distribution

Based on the multi-dimensional portraits, an "Intelligent Matching Engine for Supervisor-Counselor Collaborative Tasks" is constructed. This LLM-driven engine presets four types of collaborative scenario libraries and corresponding task templates: "Academic Alert Response," "Psychological Crisis Collaborative Intervention," "Career Development Joint Guidance," and "Academic Norms Co-Education" [5]. When a student portrait triggers the threshold for a specific scenario, the engine automatically generates a "Collaborative Recommendation List"—for example, "Suggest the counselor arrange a talk within 48 hours, focusing on understanding recent stressors; suggest the supervisor concurrently and moderately adjust experimental task intensity and provide emotional support"—and pushes it to both parties' terminals after confirmation. The core value of this mechanism lies in shifting the boundary of collaborative responsibilities from "static textual stipulations" to "dynamic task negotiation." Each instance of collaboration is no longer a vague call to "strengthen cooperation," but a concrete task package with a clear initiator, participants, timeline, and expected goals. This task-based dynamic complementarity redefines responsibility boundaries in practice, fundamentally resolving the responsibility gaming dilemma in which both "shirking" and "overstepping" coexist [3].

3.3. Precise Sharing: Human-Machine Collaboration and Consensus-Building Platform

A "Supervisor-Counselor Collaborative Intelligent Workstation" is established as a normalized technological vehicle for information sharing and consensus-building. In addition to integrating basic functions such as instant messaging, calendar sharing, and collaborative document editing, the platform features three core LLM-driven intelligent services: First, intelligent briefing generation, which automatically captures communication records and progress notes uploaded by both parties at the end of each collaboration cycle to generate a structured Collaborative Education Work Brief, thereby reducing paperwork burdens. Second, disagreement identification and mediation suggestions, which analyzes the dialogue texts of both parties to identify points of cognitive divergence and signals of value conflict, automatically pushing relevant typical cases or policy interpretations, and acting as a non-confrontational "virtual mediator" to gradually bridge conceptual gaps and repair relationship fractures. Third, knowledge graph construction, which solidifies the experiential knowledge from each collaborative process into an organizationally transferable repository of collaboration strategies, realizing the accumulation and sharing of collective wisdom.

3.4. Precise Analysis: Dynamic Evaluation and Continuous Improvement Mechanism

Transforming the static, outcome-oriented assessment logic, a data-driven "Dynamic Evaluation System for Collaborative Effectiveness" is established that emphasizes both process and outcome. This system automatically extracts platform behavioral data to generate a "Collaborative Quality Index" (CQI) from four dimensions: Collaborative Cognition (the level of mutual recognition regarding the necessity of collaboration), Behavioral Engagement (response time and completion rate of collaborative tasks), Resource Sharing (the frequency and depth of bidirectional information flow), and Student Value-Added (value-added performance in areas such as academics, mental health, and employment). The CQI is incorporated into the appointment assessment for supervisors and the promotion evaluation for counselors. This predominantly positive-incentive evaluation restructuring reverses the institutional cognition that "collaboration is an extra burden," guiding both parties from a zero-sum game to positive-sum cooperation. Simultaneously, the systemic feedback of the CQI provides a data foundation for the continuous iteration of the optimization path, forming a dynamic cycle of "evaluation – feedback – improvement."

4. Guarantee System: A Threefold Support of Institution, Capability, and Culture

4.1. Institutional Guarantee: Establishing Regulations with Ethics Foremost

It is recommended that universities enact an Implementation Measures for "Supervisor-Counselor" Collaborative Education, specifying a "university – college – degree program" three-tier collaborative structure, collaborative work standards, basic process norms, and assessment and incentive methods [2]. An Ethical Guideline for LLM-Assisted Collaborative Education should be formulated, stipulating rigid requirements for the minimum necessary principle of data collection, the interpretability and transparency of algorithms, student privacy protection mechanisms, and the attribution of responsibility in human-machine joint decision-making. Only by building robust institutional dikes can technology flow safely and orderly into educational practice.

4.2. Capability Guarantee: Dual-Track Training and Literacy Enhancement

For the supervisor group, "AI + Education" literacy should be integrated into the pre-service training for new supervisors and in-service rotation training systems, focusing on cultivating data portrait interpretation skills, human-machine collaboration awareness, and proficiency in using intelligent tools [5]. For the counselor group, relying on the university's Center for Faculty Development, subject cognition workshops and specialized data literacy enhancement programs should be conducted, helping counselors understand the academic culture and talent cultivation patterns of different disciplines, thereby strengthening their professional confidence and discursive competence in dialogues with supervisors. Encouraging supervisors and counselors to learn together through "paired training" enhances mutual understanding and trust during the learning process.

4.3. Cultural Guarantee: Value Guidance and Atmosphere Creation

Institutions and technologies can enforce behavioral compliance but cannot engender genuine collaborative consciousness. The core of cultural guarantee lies in fostering an educational ecology that is "open, inclusive, and characterized by mutual trust and symbiosis." First, continuous value dissemination and expectation shaping are carried out through annual "Supervisor-Counselor Collaborative Education" forums and excellent case sharing sessions. Second, a university-level "Supervisor-Counselor Collaborative Education Award" is established to honor supervisor-counselor pairs who excel in collaborative practice, transforming their educational stories into perceivable cultural symbols. Third, the idea that "the supervisor and the counselor are the dual wings of your growth" is conveyed to graduate students during orientation, constructing a student culture that supports collaborative education.

5. Conclusion

The in-depth development of LLM technology presents a historic opportunity for "supervisor-counselor" collaborative education, which is mired in a zero-sum game dilemma, to transcend its predicament and construct a positive-sum ecology. The "four-precision" technological path constructed in this paper—precise depiction, precise matching, precise sharing, and precise analysis—together with the threefold support system of "institutional guarantee – capability guarantee – cultural guarantee," all point to one core objective: enabling supervisors and counselors to move from "fighting alone" to "integrated operation," from "experience-driven" to "data-intelligence-driven," from a "zero-sum game" to "human-machine symbiosis," and ultimately returning to the authentic essence of "fostering virtue through education."

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