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Research on Curriculum Ideology and Politics Teaching in Higher Mathematics: A Perspective of Mathematical Modeling

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Abstract: *Under the new era's "comprehensive ideological and political education framework, integrating value guidance into public foundation courses remains a core challenge in higher education reform. As a cornerstone of science and engineering disciplines, advanced mathematics' high abstraction often creates a disconnect between ideological education and specialized instruction. This paper proposes a new pathway for integrating ideological and political education into advanced mathematics courses by leveraging "Mathematical Modeling" as an entry point.First, it analyzes the intrinsic educational logic of mathematical modeling in cultivating scientific spirit, embodying dialectical materialist thinking, and inspiring patriotic sentiments. Second, it details specific implementation pathways through three dimensions: deep mining of case libraries, implicit integration into teaching segments, and extension into extracurricular practice. Finally, it proposes safeguarding measures across three dimensions: faculty competency, digital transformation, and multidimensional evaluation systems. The study demonstrates that mathematical modeling serves as a vehicle for deeply integrating mathematical rationality with humanistic spirit, effectively enhancing students' sense of social responsibility and innovative practical abilities, thereby providing robust support for cultivating science and engineering talent in private universities.*

Keywords: *Higher Mathematics; Course-based Ideological and Political Education; Mathematical Modeling; Teaching Reform; Cultivating Talent with Integrity*

1. Introduction: The Necessity of "Curriculum Ideology and Political Education " in Higher Mathematics

As higher education advances toward a new phase of high-quality development, "cultivating virtue through education" has become the fundamental mission of universities. As the core foundational course with the broadest coverage, longest duration, and most profound influence across STEM disciplines, higher mathematics serves not only as a tool for students to master modern science and technology but also as a vital vehicle for cultivating logical thinking, rational character, and shaping values[1]. However, for a long time, higher mathematics teaching has been characterized by a tendency to "prioritize technique over principle." An excessive focus on rigorous logical derivations, complex computational techniques, and abstract definitions and theorems has often reduced classrooms to dry piles of symbols. This teaching model, detached from practical application and lacking humanistic care, not only struggles to spark students' interest in learning but also weakens the potential of mathematics education to provide ideological and political guidance.

With the deepening of educational reforms in the new era, the concept of Curriculum based Ideological and Political Education-has emerged. It calls for organically integrating ideological and political education elements into specialized course instruction, achieving a "trinity" of knowledge transmission, competency development, and value guidance. Against this backdrop, identifying an entry point that maintains mathematical rigor while carrying ideological depth is crucial. Mathematical modeling plays precisely this pivotal role. It is the process of using mathematical language to describe, simulate, and solve real-world problems, breaking down the barrier between mathematics and reality and transforming cold formulas into powerful tools for addressing issues concerning national development and people's livelihoods[1].

Using mathematical modeling as an entry point for integrating ideological and political education into the curriculum offers unique inherent advantages. Not only does it allow students to grasp the scientific

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spirit and dialectical wisdom through real-world problems in, but it also vividly demonstrates mathematics' immense contributions to national defense research, social governance, and economic development by incorporating contemporary, China-specific practical cases,but also vividly demonstrates mathematics' immense contributions to national defense research, social governance, and economic development through contemporary, China-specific case studies[2]. This paper aims to explore how mathematical modeling can infuse patriotic sentiment, scientific spirit, and dialectical materialism into higher mathematics education, forging a new pedagogical path that aligns with mathematical principles while resonating deeply with students.

2. The Internal Logic of Integrating Mathematical Modeling into Curriculum Ideology and Politics

2.1. Cultivating the Scientific Spirit: The Leap from "Solving Exercises" to "Solving Problems"

Scientific spirit is the soul of mathematical modeling. During the modeling process, students move beyond mechanically applying formulas to engage in the arduous exploration of distilling patterns from perceived phenomena. First is the attitude of rigorous realism: mathematical modeling requires students to confront real-world data that is often "disorganized." They cannot arbitrarily alter data to achieve desired outcomes. This reverence for data integrity directly points to education in research integrity. Second is critical thinking and innovation: Modeling involves continuous hypothesis-making and simplification. Teachers should guide students to question "Why this assumption?"-and "Are there better variables? Encouraging them to find optimal solutions through trial and error cultivates an innovative spirit that dares to challenge authority and relentlessly pursues knowledge. Finally, resilience in the face of failure: Establishing a mature model often requires multiple iterations of trial and error. Through this iterative modeling cycle, students deeply grasp that "truth is not attained overnight." This subtly cultivates an indomitable spirit of relentless refinement—a craftsmanship mindset that represents the most valuable psychological quality for contemporary university students on their research journey.

2.2. Manifestation of Dialectical Materialism: Discerning Essence amidst Change and Constancy

Mathematical modeling serves as a vivid arena for practicing the dialectical materialist worldview. First, it embodies the law of transformation from quantitative to qualitative change: within the integration of calculus and modeling, the concept of limits lies at its core. As the independent variable $\Delta x \to 0$, the process evolves from the local approximating curves with straight lines" to the overall summation, it perfectly demonstrates the process of micro-accumulation leading to macro-qualitative change in phenomena.Than guide students to understand that all great transformations originate from minute increments. Second, it embodies the principle of unity of opposites: in modeling, "simplification" and precision form an eternal contradiction. Models that are overly simplified lose accuracy, while those that are excessively complex become unsolvable. As students seek this equilibrium point, they learn to apply the methodology of "addressing the principal contradiction," grasping the relativity and absoluteness of phenomena under specific conditions. Third, it embodies the eternal nature of motion and development: By modeling population growth, heat conduction, or financial fluctuations through differential equations, students gain an intuitive grasp of how systems dynamically evolve over time. This cultivates a dynamic perspective, helping them recognize that the world is not a static collection of fragments but an interconnected, organically unified whole in perpetual motion[3].

2.3. Patriotism and Social Responsibility: Writing Theses on the Land of Our Motherland

Deeply integrating mathematical modeling with national strategies and social hotspots is the most effective path to ignite students' patriotic spirit. First, we can ignite national pride through "national treasures"case studies: When teaching geometric modeling or optimization algorithms, introduce coverage analysis of the BeiDou satellite constellation, structural optimization of the Hong Kong-Zhuhai-Macao Bridge, or orbital calculations for the Tiangong space station. This helps students realize that mathematics is not merely dry numbers on paper, but the hard-core foundation underpinning national comprehensive strength. Second, we can reinforce social responsibility through real-world challenges: Apply infectious disease dynamics models (like SEIR) to analyze epidemic control decisions, or use linear programming to study agricultural logistics distribution in rural revitalization. Through these closely connected topics, guide students to ponder: "How can my mathematical knowledge serve society? " "How can I address the urgent needs and concerns of the people?" Finally,

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we can cultivate engineering ethics and green development perspectives: incorporate "carbon emissions "constraints into resource allocation models and emphasize energy conservation and environmental protection in industrial production modeling. By setting modeling objectives, students grasp that technology must serve human welfare and sustainable development, planting the seed of "serving the nation through mathematics and technology for the people" in their hearts—transforming personal interest into a sense of mission[4].

3. Designing Integration Pathways Through Mathematical Modeling

3.1. Case Exploration: Constructing a Multidimensional "Ideological and Political Resource Library"

Cases serve as vehicles for integrating ideological and political education, with their depth determining educational outcomes. First, trace cultural roots to strengthen cultural confidence. When explaining the Pythagorean theorem, Liu Hui's method of inscribing circles, or solving linear equations from The Nine Chapters on the Mathematical Art, modeling ancient thinking pathways allows students to intuitively grasp the brilliance of China's world-leading ancient mathematics. Second, align with national strategies to reinforce mission commitment. We can select cases rooted in "national strategic assets, " such as using the jiaolong submersible's exterior optimization model to illustrate extremum problems, or employing Beidou satellite positioning algorithms to teach coordinate transformations and error analysis. These examples help students understand that breakthroughs in core technologies rely on foundational mathematical logic. Finally, focus on social ethics to cultivate civic literacy. We can introducing relatable real-world examples like "tiered electricity pricing models" and "optimizing urban waste sorting and transportation" guides students to balance "economic efficiency, " "social equity," and "environmental protection" during modeling. Through this multidimensional case approach, math classrooms transform from abstract symbolism into windows for understanding society and interpreting the times[5].

3.2. Teaching Process: Achieving the "Salt Dissolving in Water" Integration of Knowledge and Values

Ideological education should dissolve like salt in water—leaving no trace yet altering the flavor. During the problem introduction phase, teachers should not present direct mathematical problems but rather ambiguous real-world scenarios, such as "How to scientifically evaluate the efficacy of a new drug?"

This requires students to conduct in-depth research and collect data, cultivating rigorous social investigative awareness. During the "Model Hypothesis" stage, guide students to learn to "sacrifice the fish to obtain the bear's paw." Real-world problems are complex and dynamic; modeling necessitates simplifying secondary contradictions through reasonable assumptions to focus on primary contradictions. This process vividly embodies the dialectical materialist principle of "grasping the key point," helping students develop a big-picture perspective. During the "Model Solution and Evaluation" stage, emphasize the objectivity and limitations of results. Model outcomes are rarely absolutely "correct" but constrained by underlying assumptions. Teachers should encourage students to conduct sensitivity analyses, guiding them to recognize the relativity of truth and cultivate a scientific spirit that prioritizes facts over textbooks or authority. Through meticulously designed teaching segments, ideological and political education can flow naturally within logical reasoning, achieving a subtle yet profound educational impact.

3.3. Practical Extension: From "Simulated Battlefields" to "Social Practice"

Practical activities beyond the classroom serve as the "litmus test" for ideological education outcomes. First, character is forged through modeling competitions. Organize and encourage student participation in high-level events like the China Undergraduate Mathematical Modeling Competition (CUMCM). These competitions require teams of three to solve complex problems within three days and nights—a contest not only of knowledge but also of willpower, psychological resilience, and teamwork.

The collective sense of honor and contractual spirit forged through all-nighters and intense debates cannot be replicated by theoretical lectures alone. Secondly, we launched the "Mathematical Modeling + Social Research "extracurricular program. Students are encouraged to engage with communities and businesses, conducting research on real-world challenges such as "bicycle deployment planning" and "predicting community eldercare needs." Witnessing their models adopted by relevant authorities or

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recognizing gaps in existing knowledge significantly boosts their intrinsic motivation and social responsibility. Finally, integrate digital literacy development. We can guide students in the practical, ethical use of AI tools and programming software, emphasizing academic integrity and zero tolerance for data fabrication. This pathway—extending from the classroom to competitions and into society—achieves an emotional leap from "learning mathematics" to "applying mathematics to serve the nation."

4. Implementation Strategies and Safeguards

4.1. Enhancing Teachers' Ideological Awareness and Teaching Capabilities

Teachers serve as the primary agents of ideological education within the curriculum and the initiators of pedagogical reform. First, it is essential to dismantle the entrenched mindset among mathematics educators that their role is solely to teach not to nurture students. Universities should regularly organize interdisciplinary teaching seminars, inviting experts in ideological education to engage in dialogue with distinguished mathematics modeling instructors. This facilitates teachers' discovery of philosophical beauty within logical reasoning and the refinement of social responsibility through algorithmic optimization. Second, teachers should actively engage in revisiting the history and philosophy of mathematics. Only when educators deeply comprehend the cultural foundations and dialectical logic underlying mathematical development can they seamlessly integrate these insights into their teaching, avoiding awkward, forced moralizing. Additionally, teachers should be encouraged to engage in social practice or temporary assignments to encounter real-world industrial production and social governance challenges, accumulating vivid modeling materials. Establishing "Thought-Politics Master Teacher Studios" or "Curriculum-Thought-Politics Teaching Teams" can foster mentorship mechanisms, transforming teachers from mere "knowledge imparters" into humanistic "problem solvers" and "guides."

4.2. Digital Transformation as an Enabling Pathway

Digital technologies provide intuitive, scenario-based implementation methods for integrating mathematical modeling with ideological and political education. Utilizing smart teaching platforms like SuperStar Learning Pass and Yu Classroom enables the construction of a dynamically updated "Mathematical Modeling Ideological and Political Education Case Library." Instructors can employ visualization tools like Manim to vividly display abstract mathematical dynamics—such as limit convergence or function optimization trajectories—enabling students to appreciate the beauty of mathematical order through visual impact. Simultaneously, big data technology enables precise tracking of student learning trajectories. For instance, keyword analysis in online discussion forums reveals student sentiment toward specific social modeling topics (e.g., evaluating poverty reduction policy effectiveness), facilitating targeted interventions. Additionally, AI-powered virtual simulation platforms can be developed to model complex social systems, immersing students in environments that demonstrate the rigor of scientific decision-making. Digital tools not only transcend temporal and spatial constraints but also integrate ideological and political elements seamlessly throughout the teaching process through diverse content formats, much like salt dissolving in water.

4.3. Establishing a multidimensional evaluation system and long-term mechanisms

The traditional "one exam determines one's future" evaluation model struggles to objectively measure the educational effectiveness of course-based ideological and political education. It is imperative to establish a comprehensive, multi-dimensional assessment and assurance system. First, the weight of formative assessment should be increased. Student performance in communication within modeling groups, teamwork spirit, and depth of insight into social issues should be incorporated into assessment metrics.For instance, a "Social Impact Assessment "section should be added to modeling reports to evaluate whether students considered the ethical costs and sustainability of their models. Second, implement diverse evaluation sources. Beyond instructor grading, incorporate peer reviews and self-reflection, enabling students to cultivate appreciation and respect through evaluating others while strengthening self-education through introspection. Finally, schools should establish incentive mechanisms. Link achievements in curriculum-based ideological and political education and awards from mathematical modeling competitions to faculty promotion, tenure, and performance bonuses. This creates a sustainable operational framework characterized by "institutional emphasis, departmental support, and faculty initiative." By leveraging the evaluative system asa guiding force, teaching priorities shift from pure knowledge assessment toward comprehensive competency evaluations that equally value knowledge, skills, and values.

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5. Conclusion

The integration of ideological and political education into higher mathematics courses through mathematical modeling represents not merely a refinement of teaching methods but a profound transformation that returns to the essence of education. It infuses mathematics classrooms with human warmth and contemporary logic, enabling students to master rational tools while cultivating deep emotional connections to their nation and society. Through continuous exploration, practice, and refinement, we will undoubtedly establish a scientific, efficient, and nurturing mathematical education system, contributing mathematical strength to cultivate well-rounded builders for the new era.

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References

[1] Gao Deyi, Zong Aidong. From Ideological and Political Courses to Ideological and Political Education in Courses: Constructing a Higher Education Ideological and Political Education Curriculum System from a Strategic Perspective. Chinese Higher Education, 2017(01): 43-46.
[2] Gu Pei. Uncovering Ideological and Political Elements in Mathematics Courses. Chinese University Teaching, 2020(02): 15-18.
[3] Xuan Conghua, Jiang Yingjun. Exploration and Practice of Integrating Ideological and Political Education into Higher Mathematics Instruction. Journal of Mathematics Education, 2021, 30(02): 89-93.
[4] Wang Hongzhou, et al. Exploration of Ideological and Political Elements in Mathematical Modeling Cases and Teaching Practice. Mathematics for Engineering, 2022,38(04): 102-107.
[5] Zhang Wenbo, Liu Weifeng. Research on Teaching Reform of "Curriculum Ideological and Political Education" in Higher Education Institutions Using Mathematical Modeling Competitions as a Vehicle. Education Theory and Practice, 2020, 40(27): 54-56.