The Value Implication, Realistic Dilemma and Practical Pathways of Digitalization in Curriculum Ideological and Political Education

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Abstract: The digitalization of curriculum ideology and politics deeply integrates red cultural resources and frontier academic dynamics through digital technologies such as VR/AR immersive teaching and big data analysis, and constructs student digital portraits. By implementing this integrative approach, institutions can now harmonize ideological cultivation with disciplinary teaching, resolving a persistent challenge in modern education. At present, faced with the practical difficulties such as the superficial application of technology and inadequate digital literacy among teachers, it is essential to systematically enhance the digital literacy of both teachers and students, build a multi-dimensional interactive digital platform, deepen the integration and innovation of disciplinary knowledge with ideological and political education, while establishing a multidimensional digital evaluation mechanism. These measures collectively pursue a synergistic educational paradigm that integrates knowledge construction, competency development, and value cultivation, while advancing resource-sharing mechanisms and personalized learning implementation to fulfill the fundamental mandate of moral education and talent development, thereby providing strategic reinforcement for building a globally competitive education system.

Keywords: Curriculum Ideological and Political Education; Digitization; Practical Pathways; Fostering Virtue and Educating Talent

1. Introduction

With the deep integration of new-generation information technologies such as 5G, big data, and intelligent connectivity with higher education, ideological and political education in curricula is facing a transformation from traditional indoctrination towards digitization and intelligence. In 2020, the Ministry of Education's Guiding Outline for the Construction of Ideological and Political Education in University Courses clearly stated, innovate classroom teaching modes, promote the application of modern information technology in ideological and political education in curricula, facilitate the sharing and common use of high-quality resources among universities, stimulate students' interest in learning, and guide students to think deeply.

Comprehensively promoting the development of ideological and political education within curricula constitutes a strategic approach to fulfilling the fundamental mission of cultivating talent through virtue, with an emphasis on prioritizing moral education and ensuring comprehensive development[1].In 2022, the Ministry of Education developed the national standard Teachers' Digital Literacy, which outlines a framework for teachers' digital literacy and clearly proposes that teachers should apply digital technology to optimize, innovate, and transform educational and teaching activities, encompassing digital instructional design, teaching implementation, Academic appraisal, professional development, social responsibility, and digital collaborative education[2]. Against this backdrop, the ideological and political education in curricula for engineering majors such as Vehicle Engineering and Mechatronic Engineering urgently needs to address the challenge of the separation between ideological and political education and the imparting of professional knowledge through digital technologies such as VR immersive teaching and intelligent analysis of students' learning situations, achieving an organic unity of value shaping, ability cultivation, and knowledge imparting.

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2. The Value Implication of Digitalization in Ideological and Political Education

The digitization of ideological and political education in curricula leverages technology to reconstruct the educational ecosystem. The adoption of 5G and AR/VR enables the creation of immersive teaching contexts, revolutionizing pedagogy from unidirectional knowledge delivery to experiential, scenario-based learning. Additionally, big data analysis of students' learning situations is employed to construct digital portraits of students. Furthermore, through distributed cloud resource-sharing frameworks, high-quality ideological and political education cases are shared across universities, forming a deeply integrated digital teaching mode of ideological and political education in curricula that encompasses knowledge imparting, ability cultivation, and value cultivation. This ultimately establishes an intelligent, digital educational system for ideological and political education in curricula that evaluates across all time and space, involving all elements, and throughout the entire process.

2.1 Innovating Educational Philosophy

The current engineering education system, which prioritizes knowledge transmission over value guidance, has led to a disconnect between ideological-political education and academic expertise cultivation, a phenomenon often described as "two separate layers". The digitalization of ideological-political education in curricula emerges as a critical solution to bridge this gap between knowledge delivery and value cultivation [3]. While AI facilitates efficient knowledge acquisition, and intelligent algorithms demonstrate superior capabilities in extensive data collection, in-depth analysis, and predictive modeling compared to human capacities [4]. it becomes imperative to leverage digital technologies to synergistically achieve the cohesive interweaving of knowledge impartation, competency development, and value shaping. By establishing digital platforms through AR/VR immersive teaching and intelligent learning analytics, educational scenarios are reconstructed to embed ideological and political elements, such as patriotism, spirit of craftsmanship, and scientist ethos into course content. This strategy enables the digital-physical integration of small ideological-political classrooms" with "large societal classrooms", thereby expanding moral education pathways and innovating pedagogical models. Digital innovation in collaborative education not only cultivates students' ability to solve complex engineering problems but also fosters their capacity for "from-scratch" innovation and the mission-driven commitment to advancing national technological progress. This approach drives the entire educational process, including curriculum design, teaching implementation, and evaluation feedback, while focusing on core competencies, such as collaborative communication, innovative thinking and problem-solving, ultimately promoting all-member, whole-process, and comprehensive education to fulfill the fundamental mission of fostering virtue through education.

2.2 Reconstructing the Teaching Model

The innovation of digital teaching models demonstrates new dimensions of educational adaptability, foresight, and human-centricity, charting transformative pathways for pedagogical evolution [5]. Digital instructional approaches—including flipped classrooms, blended learning, online collaboration, and knowledge mapping—transcend temporal and spatial constraints to enable differentiated instruction and diversified learning while enhancing digital literacy among both educators and students. Concurrently, VR/AR scenario simulations can construct immersive virtual environments and showcase China's enduring cultural heritage and revolutionary ethos, thereby deepening patriotic sentiment. Supported by multimodal data analytics, AI-driven learning behavior analysis precisely identifies students' learning needs and characteristics to construct comprehensive digital profiles, guiding learners to maintain proactive engagement, continuously optimize self-directed learning strategies, and develop higher-order competencies such as problem-solving, decision-making, critical thinking, and creative innovation. This paradigm cultivates ideological-political literacy encompassing the spirit of inquiry, scientific rigor, and craftsmanship, actualizing wisdom-awakening and heart-nurturing education through intelligent, personalized teaching that adapts to individual aptitudes.

2.3 Integrating Educational Resources

Digital technologies have significantly enriched the teaching resources for ideological and

political education in curricula, providing effective support for integrating diverse materials—such as China's outstanding traditional culture, revolutionary culture, and cutting-edge disciplinary developments—into engineering education [6]. The creation of digital repositories for ideological-political pedagogy facilitates inter-institutional and inter-regional resource integration. Through 5G and cloud computing, these platforms aggregate multidisciplinary materials spanning revolutionary heritage and industrial progress, enriching educational diversity. Through big data-driven optimization, the development of digital resources including 3D modeling and virtual labs which is significantly enhanced. Integrated with cloud computing and mobile networks, this approach builds an extensive digital repository featuring classical literature databases, immersive exhibitions, archival digitization, records of artisan masters, and science innovator portraits. Implementation requires conducting resource surveys and needs analysis, collaborating with enterprises, cultural institutions, and partner universities to co-develop practical cases, establishing interdisciplinary integration mechanisms and online sharing platforms, and enhancing faculty training in information technology. Teaching cases should horizontally expand to cover discipline-related and frontier topics while vertically delving into the humanistic qualities embedded within Chinese civilization, seamlessly blending traditional cultural essence with professional instruction. Digital virtual simulations recreate intangible cultural heritage techniques, online projects address real-world industry demands, and remote practice sessions strengthen skill development, enhancing both interactivity and engagement while enabling students to internalize artisanal epistemology through technical mastery and bolster cultural confidence via immersive experiences. Dynamic real-time updates ensure teaching materials remain current, meeting diverse faculty and student needs, ultimately fostering a society-wide educational ecosystem that cultivates national pride, professional esteem, and critical thinking abilities among learners.

3. Practical Challenges in the Digitalization of Ideological and Political Education

The universal application of curriculum-based ideological and political education has become to a consensus in higher education. The "Guidelines for Curriculum-based Ideological and Political Construction in Higher Education Institutions" formulated by the Ministry of Education provides both value orientation and practical frameworks for implementing curriculum-based ideological and political education across various disciplines. Following these guidelines, higher education institutions across the country have promoted curriculum-based ideological and political education, developing corresponding instructional designs, demonstration cases, and educational systems.

In practice, however, issues such as simplistic pedagogical concepts and teachers' agency deficiency persist, which objectively hinders the effective fulfillment of the fundamental task of fostering virtue through education [7]. Based on the challenges encountered in implementing curriculum-based ideological and political education in engineering courses at universities, and incorporating research and practice conducted in recent years in areas such as first-class courses, blended courses, and curriculum-based ideological and political education, this paper identifies common practical challenges in the digitization process of curriculum-based ideological and political education in engineering, including insufficient digital literacy among faculty, superficial application of technologies, and challenges in disciplinary integration.

3.1 Insufficient Digital Literacy among Faculty

The cultivation of teachers' digital pedagogic capacities in technology-mediated learning environments constitutes a dual imperative: addressing systemic demands of instructional innovation while constructing graduated pathways for continuous professional growth. However, in the digital transformation of curriculum-based ideological and political education, there exists a deficiency in faculty digital literacy. Teachers demonstrate limited proficiency in technologies such as AI, big data, augmented reality (AR), and virtual reality (VR), which hampers their ability to conduct precise ideological and political instruction [8]. Three primary challenges emerge: First, the development capacity of digital teaching resources remains weak, with the majority of teachers only capable of utilizing basic tools like PowerPoint for simple tasks, lacking the ability

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to create micro-lectures, animations, and other advanced digital instructional materials. Their application of specialized digital knowledge, such as web design, information security and artificial intelligence, retains a rudimentary level, demonstrating a deficiency in systematic logical frameworks and advanced development competencies. Second, operational deficiencies in smart teaching platforms—faculty exhibit limited proficiency in advanced applications of MOOC/SPOC systems, coupled with over-reliance on external digital resources rather than autonomous technological adaptation, manifesting as an "application-over-innovation, replication-over-development" pattern that creates a polarized digital literacy landscape of "high basic adoption but low specialized mastery." Third, deficiencies exist in data analytics and learning diagnostics capabilities, manifesting in ineffective collection and analysis of massive behavioral data generated through instruction, inability to accurately assess students' cognitive trajectories, and failure to establish scientific learning evaluation models, consequently weakening the effectiveness of ideological and political education. Root causes include both objective constraints like aging teacher demographics and systemic shortcomings such as incomplete training systems and absent motivational mechanisms, necessitating systematic training programs and refined digital literacy evaluation standards as solutions

3.2 Superficial Application of Educational Technology

Its practical implementation predominantly exhibits superficial characteristics.

While the application of digital technologies in curriculum innovation has become gradual widespread, its implementation often remains superficial. Many higher education institutions merely treat digital tools as instrumental supplements, failing to drive fundamental transformations in pedagogical paradigms and assessment systems [9]. First, the reduction of digital technologies to simple teaching tool enhancements—some universities utilize smart campus equipment merely as electronic blackboards, failing to establish an educational paradigm that deeply integrates digitalization with curriculum-based ideological education; others maintain singular teaching resources and persist with unidirectional teacher lectures, student listens pedagogical models that lack interactivity and engagement, resulting in ineffective learning transmission and diminished educational outcomes. Second, curriculum development stagnates at resource digitization—institutions prove unable to effectively utilize these resources to guide and support student learning, while excessive student reliance on digital tools erodes logical thinking, innovative capacity, and digital social responsibility. This instrumentalist approach creates a sever interconnection between digital technology applications and the fundamental mission of fostering virtue through education. Third, competency-based evaluation redesign overemphasize quantitative metrics—teacher-student interactions become reduced to click-through statistics, with algorithms failing to capture authentic affective attunement, thereby weakening humanistic care and diluting educational values. Consequently, the digital teaching and learning model for curriculum-based ideological education urgently requires systemic reforms encompassing Human-AI collaborative teaching and comprehensive digital literacy assessment frameworks.

3.3 Barriers to Interdisciplinary Integration

Interdisciplinary integration, as an innovative pedagogical model, aims to eliminate disciplinary boundaries and foster academic innovation and breakthroughs by synthesizing domain-specific knowledge, methodological skills, and cognitive frameworks across fields, thereby cultivating students' capacity to tackle intricate challenges, enhancing comprehensive competencies, and fostering comprehensive growth. However, its application runs into multifaceted challenges including detailed pedagogical structuring, insufficient faculty knowledge reserves, students' adaptation difficulties, resource-sharing barriers, demands for innovative teaching methods, and unitary evaluation criteria[10].Firstly, interdisciplinary curriculum development faces significant challenges in interdisciplinary knowledge bridging, extended development timelines, and teachers' limited experience, making it hinder the precise identification of interdisciplinary convergence areas, which impairing the disciplinary depth professional transferability and practical viability. Traditional pedagogical methods are increasingly inadequate to meet contemporary educational demands, urgently

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embracing blended subject-spanning teaching techniques such as project-based learning, case-based instruction, and industry-academia collaboration. This paradigm shift presents substantial challenges to instructional design competencies. Secondly, interdisciplinary teaching requires faculty to possess extensive knowledge breadth, yet current educators often exhibit structural limitations due to prolonged specialization in singular disciplines, resulting in deficient cross-disciplinary perspectives and knowledge synthesis abilities, thereby constraining effective guidance for students exploring interdisciplinary issues and limiting instructional depth and breadth. Thirdly, students critically needs metacognitive upgrading, as conventional teaching has ingrained single-discipline thinking patterns, leaving them deficient in multi-perspective analytical skills and interdisciplinary knowledge application for complex problem-solving. Fourthly, Piecemeal learning materials shared educational resources exacerbate implementation difficulties, forcing excessive time expenditure on resource collection and integration, significantly impairing teaching efficiency. Furthermore, the absence of scientific, unified evaluation standards—coupled with significant disparities between disciplinary assessment systems—hinders objective measurement of teaching quality and learning outcomes, obstructing continuous improvement of interdisciplinary education.

4. Practical Pathways for Digitalizing Curriculum-based Ideological and Political Education

4.1 Enhancing Digital Literacy among Faculty and Students

In the digital era, digital literacy is pivotal to the personal development, learning efficiency, and innovative capabilities of both teachers and students. Consequently, enhancing digital competency constitutes a critical success factor for educational digital transformation. At the institutional level, universities should regularly organize training sessions on digital teaching technologies for faculty, host specialized lectures and workshops on digital literacy, and facilitate the sharing of teaching experiences and outcomes to foster mutual learning and skill advancement. Establishing a digital resource center for curriculum-based ideological education is essential—integrating cutting-edge technologies, engineering applications, research projects, and other multimodal teaching resources while embedding educational elements such as the spirit of scientists, craftsmanship, patriotism, and the "Four Confidences" to create transferable and reusable digital teaching models that achieve deep integration of knowledge delivery, skill cultivation, and value guidance. Concurrently, incorporating information technology courses into the curriculum ensures systematic digital literacy education for all students. At the individual level, educators and students should proactively adopt lifelong digital learning mechanisms, systematically develop key competencies in AI development, multimodal resource integration, and data analytics, and craft personalized development pathways to nurture interdisciplinary digital innovation capabilities. On the societal support front, government bodies must strengthen policy backing and resource allocation, formulate standardized criteria and certification systems for digitalized curriculum-based ideological education, and collaborate with technology firms and universities to develop contextualized digital platforms that merge professional knowledge with ideological cultivation, ultimately establishing replicable model demonstration bases for digitalizing curriculum-based ideological education.

4.2 Advancing the Deep Integration of Curriculum-based Ideological Education and Digital Technologies

The digital development of curriculum-based ideological education must not only integrate knowledge delivery with ideological cultivation to fulfill the fundamental mission of fostering virtue through education but also address the challenges posed by massive, fragmented information and bridge the digital divide to enhance students' comprehensive competencies. Consequently, curriculum-based ideological teaching requires comprehensive innovation in educational objectives, pedagogical philosophies, content design, instructional methods, and course architecture to ensure contemporaneity and cutting-edge relevance. The teaching process should embody inquiry-based, personalized, and challenging characteristics, achieving organic integration of knowledge, skills, and qualities to cultivate students' complex problem-solving abilities and higher-

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order thinking. First, leveraging digital technologies to systematically optimize and integrate teaching resources can enrich ideological educational content, utilizing digital mediums such as e-books, online courses, and digital museums to deeply excavate ideological elements embedded within disciplinary curricula. Second, educators should incorporate subject-specific characteristics by selecting high-quality materials including global political developments, Chinese civilization, and China's international responsibilities, skillfully integrating them into teaching content through digital means to broaden students' global perspectives while nurturing cultural confidence and patriotic sentiment. Third, employing advanced technologies like virtual humans, digital twins, and generative AI enables innovative demonstrations of knowledge and values to enhance pedagogical engagement, diversify and elevate online content quality, and pioneer new ideological education models that facilitate learners' transition from surface-level to autonomous deep learning, thereby cultivating independent thinking, critical analysis, and collaborative competencies. Fourth, digital technologies transcend geographical barriers to facilitate global information exchange and economic development while providing unprecedented opportunities for East-West cultural dialogue and prosperity; in teaching cultural exchanges and civilizational studies. In the context of cultural exchange and the pedagogy of Eastern and Western civilizations, it demonstrates cultural confidence; within historical and cultural accumulation, it promotes cultural innovation and inheritance. The profound application of digital technologies provides indispensable support for curriculum-based ideological education, enabling natural fusion between disciplinary instruction and ideological cultivation—immersing students in cultural embodiment and patriotic values through unified knowledge-action practice, consciously elevating theoretical and political literacy, and more effectively realizing the fundamental mission of moral education.

4.3 Establishing a Multidimensional Interactive Digital Teaching Platform

The creation of a multidimensional interactive digital teaching platform constitutes a pivotal step in the digital construction of ideological and political education within university curricula. Currently, traditional unidirectional teaching models are constrained by temporal and spatial limitations, impeding teacher-student interaction and restricting students' proactive participation and deep thinking. Multidimensional interactive digital platforms can transcend these limitations of conventional teaching methods, enhance instructional efficiency, accommodate diverse learning needs, achieve Student-centered interaction and personalized cultivation, effectively stimulate students' learning motivation, and deepen value-oriented guidance. Specifically, such platforms must incorporate three core functionalities: First, the platform should integrate digital technologies including augmented reality (AR)/virtual reality (VR) scenario simulations and AI algorithms to facilitate intelligent interaction between teachers and students, enabling students to cultivate wisdom and nurture moral character through immersive multi-scenario experiences. Second, the platform must establish data tracking and competency-based assessments, collecting and analyzing learning behavior data to construct precise digital profiles of students, assess teaching quality, dynamically optimize instructional strategies, achieve differentiated and personalized educational objectives. Third, the platform should establish high-quality ideological and political education resources encompassing China's outstanding traditional culture, red culture, craftsmanship spirit, and scientist spirit. These resources should cultivate an indomitable ambition, foster patriotism, internalize moral education goals in mind and externalize them in action, and achieve an organic integration of professional teaching and ideological-political literacy. Therefore, establishing a diversified interactive digital platform can both enlighten the mind and nurture the soul, while truly achieving personalized teaching tailored to individual aptitudes.

4.4 Establishing a Digital Multidimensional Evaluation Mechanism: A Case Study of "Automobile Structure" Course

The creation of a digital multidimensional evaluation mechanism for curriculum-based ideological education represents an inevitable trend in the intelligent educational assessment development of ideological cultivation. By leveraging big data, cloud computing, and AI technologies, we can establish a digital multidimensional evaluation system for

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curriculum ideological-political education. This system enables all-round evaluation covering engineering knowledge, problem analysis, solution formulation, moral character, value identification, and cultural confidence. Through AI-powered interactive smart teaching systems that track whole-process data, intelligent analysis of students' learning trajectories, styles, and characteristics enables precise digital profiling, facilitating the development of targeted talent cultivation plans and personalized instructional services to achieve intelligent, individualized, and efficient education. Regarding evaluation implementation methods, the mechanism can incorporate real-time diagnostic and adaptive feedback systems to provide immediate growth assessments and precise developmental recommendations, thereby achieving organic integration of formative and summative evaluations to promote stepwise synchronized Enhancement of academic literacy and ideological and political literacy. Evaluation entities can leverage cloud-based collaborative spaces to integrate peer evaluation among students, home-school collaborative evaluation, industry-education integration evaluation, and other multi-party participations, thereby transforming the assessment mechanisms of curriculum ideological and political education from simplified quantitative approaches to diverse integration, thus transforming the assessment mechanism from simplistic quantification to multidimensional integration. This approach makes evaluations more scientization, standardization, objectification and humanization to ensure simultaneous enhancement of students' professional competencies and ideological cultivation. The "Automobile Structure" course deepens ideological and political education through digital means, establishing a "Three-Whole Education" evaluation system. By integrating online and offline resources including e-books, video lectures, interactive exercises, and discussion forums, the course implements blended learning and flipped classroom models through the Superstar Learning Platform and Rain Classroom smart teaching systems to achieve comprehensive data collection. It features structured discussion modules analyzing Sino-foreign new energy policies, global deployment of electric vehicles, profiles of prominent scientists, and case studies of master craftsmen, utilizing digital tracking to monitor students' ideological development. The curriculum reform includes assessment questions related to comparative studies of automotive development between China and foreign countries, as well as analyses of cultural differences in automobile culture, and combine AI grading with manual evaluation to construct digital profiles of ideological literacy within the vehicle engineering curriculum cluster. The intelligent platform monitors learning progress through multidimensional tracking of classroom performance, study habits, reflective journals, and peer-assessment data, employing learning analytics to generate personalized development reports and maintain electronic learning portfolios. An innovative interactive evaluation mechanism enables instructors to conduct precision assessments using platform analytics, students to perform peer evaluations through dedicated modules, teaching and research offices to diagnose quality assessments of teaching based on cloud-based data. This multidimensional evaluation framework combines explicit and implicit assessment criteria across four dimensions: knowledge level, practical skills, professional competence, and ideological cultivation, with digital technologies providing the entire process of dynamic visual analytics throughout the learning cycle.

5. Conclusion

The digitization of ideological and political education represents an inevitable trend in the deep integration of next-generation digital technologies such as 5G, big data, and intelligent networking with higher education, with its core mission being to resolve the disconnection between ideological cultivation and knowledge delivery. Through immersive VR/AR teaching and intelligent learning analytics, digitalized ideological education reconstructs the pedagogical ecosystem, transforming value guidance from one-way indoctrination to contextualized experiences while enabling personalized precision education. Digital technologies integrate diversified resources including red culture and industrial advancements to build shared ideological case libraries, achieving organic unity of knowledge transmission, skill development, and value formation. However, current practice faces challenges such as insufficient digital literacy of teachers, superficial application of technology,

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and barriers to disciplinary integration. Teachers lack the ability to apply technologies such as AI and big data, and the development of digital teaching resources is weak; some institutions merely treat technology as tool upgrades without addressing the fundamental changes in educational philosophy; integrated subject teaching encounters difficulties in knowledge integration and resource sharing. To advance from instrumental application to educational essence, digitized curriculum ideology and politics requires comprehensive measures: enhancing digital literacy across faculty and students, constructing multi-dimensional interactive platforms, deepening disciplinary integration, and establishing intelligent evaluation mechanisms. Ultimately, these efforts will realize holistic education across all participants, processes, and dimensions, fulfilling the fundamental mission of fostering virtue through education.

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