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Exploring the Integration of High-Level Applied Talent Development with Integrity Education in Municipal Universities

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Abstract: The digital transformation of education has expanded the boundaries of postgraduate education capacity, but it has also brought about technological sophistication in academic misconduct and reduced transparency in educational processes. This has created a disconnect between integrity education and traditional talent cultivation models. Consequently, this paper focuses on cultivating high-level applied talent in municipal universities by constructing an integrated educational framework centred on the "philosophy-mechanism-pathway" model. Guided by the 'Three-Dimensional Education' philosophy, the framework uses a data-driven operational mechanism that integrates value embedding and dynamic assessment. This enables the systematic design of an integrity education practice system that encompasses the entire talent development journey. Empirical validation from sample institutions demonstrates the efficacy of the framework in fostering the synergistic development of integrity literacy and professional competence. This provides a practical reference for peer institutions seeking to fulfil their fundamental mission of promoting virtue through education.

Keywords: Digital Transformation; Postgraduate Integrity Education; Integrated Paradigm; Applied Talents; Holistic Education

1. Introduction

1.1 Legal and Policy Foundations of Integrity

The promulgation and implementation of the Degree Law of the People's Republic of China has elevated the baseline of academic integrity from moral self-discipline to legal compulsion. This reflects the high priority accorded to academic governance and talent cultivation [1,2]. Indeed, integrity as a fundamental principle is already fully embodied within China's legal framework. The Civil Code contains twenty-six articles that explicitly stipulate the principle of good faith or matters about it, and a further two articles that implicitly address such matters [3]. In the field of intellectual property, the Copyright Law also requires explicit provisions similar to those in the Trademark Law and Patent Law, which state that the acquisition and exercise of copyright must be in accordance with the principle of good faith [4]. This further underscores the pivotal role of integrity as a core industry value and foundational principle for professional endeavours [5].

1.2 Challenges in the Digital Transformation of Integrity Education

Against this backdrop, municipal universities, which play a key role in regional economic and social development by cultivating talent for frontline innovation, are tasked with nurturing high-level applied professionals. This requires graduates not only to master advanced technical skills but also to uphold high moral standards. However, while the current digital transformation of education is invigorating talent cultivation, it is also profoundly altering traditional academic ecosystems. This creates new and formidable challenges for the longstanding issue of integrity education for postgraduate students. The core problem lies in the disconnect between integrity education and traditional talent cultivation models in a digital environment where deep integration is difficult to achieve [6].

Specifically, the above integration dilemma manifests in three main ways:

Firstly, the increasing use of technology has led to a certain degree of divergence between the objectives of "prevention and control" and "educational nurturing." While digital technology enhances efficiency, it also enables

academic misconduct to evolve; acts such as plagiarism and fabrication are becoming more covert and sophisticated with the help of intelligent technological tools [7]. This limits the effectiveness of purely technical governance approaches, such as relying on plagiarism detection software and online invigilation [8][9]. While these methods strengthen external oversight, they risk reducing integrity education to a technical contest. This undermines the internalisation of academic values and potentially damages trust between staff and students. At the same time, traditional integrity education methods, such as value-based lectures and exemplary role models, have insufficient appeal and efficacy in the complex and evolving landscape of digital academia. This reflects the current lack of effective collaboration between the instrumental and value-based dimensions of integrity education.

Secondly, diminished transparency in the academic creation process raises concerns about the potential weakening of researchers' capabilities [10]. As postgraduate students increasingly rely on intelligent tools throughout the research process, the critical thinking, knowledge integration skills, and normative awareness that should be developed through practice risk being replaced by technology. This blurs the boundaries of academic authorship and, in the long term, may hinder students' ability to conduct independent research, thereby impeding the development of essential competencies in high-level talent.

Thirdly, the content and form of traditional integrity education models are outdated [11]. Current curricula do not adequately cover new digital-age topics such as data ethics, algorithmic accountability, and the responsible use of intelligent technologies. Educational methodologies also struggle to integrate effectively with highly digitised learning and research environments. This creates a

disconnect between the education on offer and students' actual needs, rendering it unfit for purpose in the rapidly evolving technological landscape and increasingly complex ethical scenarios in academia.

In response to the challenges above, graduate integrity education must evolve beyond the mere online migration of traditional models and the superficial integration of technological tools. This requires a systematic reconstruction of its underlying philosophy, mechanisms, and implementation pathways. Based on this premise, this study examines a viable approach within the framework of talent development at municipal universities, utilizing digital tools to foster the development of integrity literacy. The initiative aims to provide practical solutions for the fundamental task of fostering virtue through education.

2. Theoretical Framework: Constructing an Integrated Model for "Digital-Empowered Integrity Education"

To address the integration challenges above, this study combines the theory of technological mediation with the concept of "Three-Dimensional Education" to create an integrated model for "Digital-Empowered Integrity Education" (see Figure 1). This model overcomes the limitations of purely technological application or value indoctrination through systematic design across three tiers: conceptual framework, operational mechanisms, and implementation pathways. It facilitates the organic integration of digital technologies, integrity values, and talent cultivation processes. The entire framework is grounded in the practical demands of talent development in municipal universities. The model provides a clearly structured theoretical reference for integrity education practices, addressing the challenges of digital transformation.
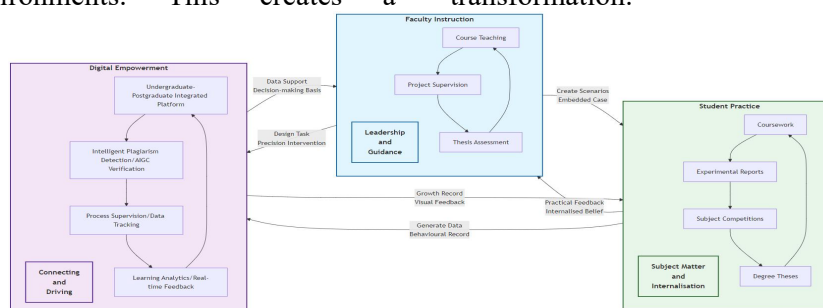
Figure 1. Schematic Diagram of the Digital Empowerment-Based Integrity Education Integration Model

2.1 Strategic Integration: Guiding the Value Orientation of Digital Transformation through the "Three-Pronged Approach to Education"

As the overarching design of the entire model, strategic integration determines the fundamental direction and value principles of digital transformation. This study argues that educational digital transformation is not a value-neutral technological process, but should be rooted in robust educational principles. The "Three-Pronged Holistic Education" philosophy provides fundamental principles for rebuilding integrity education in a digital context, focusing on promoting organic integration across three levels.

At the level of full participation, the primary agents of integrity education in the digital environment have evolved from the traditional teacher-student relationship to a collaborative system involving multiple stakeholders and technological platforms [12]. As new stakeholders, these platforms collaborate with educators, students, and administrators to foster an educational community. Rather than substituting human agency with technology, their significance lies in reconfiguring and reconnecting the responsibilities of all stakeholders through technology, thereby establishing a network of collaborative accountability. At the level of comprehensive integration, digital technology enables the full-cycle documentation of students' academic conduct. Strategic integration requires such data tracking to transcend mere behavioural monitoring and serve the cultivation of values. Through interpreting and providing feedback on learning and research data, integrity education permeates every stage of students' academic development, providing a tangible, reflective, and immersive educational experience. At the level of comprehensive collaboration, diverse digital platforms and tools serve as vehicles for implementing integrity education. Their functional design must align with the cultivation of an academic integrity culture. For example, plagiarism detection systems should not only filter text, but also provide reports that guide students in understanding academic norms and respecting intellectual property rights. This ensures that the objectives of cultural cultivation are reflected in the use of these tools.

At the level of full participation, the agents of integrity education in digital environments have expanded beyond the traditional teacher–student relationship to include a collaborative system of multiple stakeholders, including technological platforms. As new stakeholders, these platforms co-create the educational community alongside teachers, students, and administrators. Rather than replacing human agency with technology, their significance lies in reconfiguring and reconnecting the responsibilities of all stakeholders through technology, thereby forming a network of collaborative accountability. At the level of comprehensive integration throughout the process, digital technology enables the recording of students' academic conduct throughout their entire academic journey. Strategic integration requires such data tracking to transcend mere behavioural monitoring and serve the goal of nurturing values. Through interpreting and providing feedback on learning and research data, integrity education becomes embedded in every stage of students' academic development, transforming into an immersive, reflective educational experience that is perceptible to students. Digital technology enables the recording of students' academic conduct throughout their entire academic journey, providing comprehensive integration at every stage of the process. Strategic integration requires such data tracking to transcend mere behavioural monitoring and serve the goal of nurturing values. By interpreting and providing feedback on learning and research data, integrity education becomes embedded in every stage of students' academic development, transforming into an immersive, reflective educational experience. At the level of comprehensive coordination, diverse digital platforms and tools serve as the foundation for implementing integrity education. Their design must align with the development of an academic integrity culture. For example, plagiarism detection systems should not only filter text, but also provide reports that guide students in understanding academic norms and respecting intellectual property rights. This embeds cultural development within the use of the tool.

For municipal universities, strategic-level integration is particularly significant. The talents they cultivate will directly serve regional socio-economic development, and their

integrity will underpin the transmission of trust from academic training to professional practice. Therefore, it is crucial to establish strategic educational objectives that prioritise both digital literacy and ethical character, ensuring that technological empowerment consistently revolves around the fundamental task of cultivating trustworthy, high-calibre professionals.

2.2 Mechanism-Level Integration: Establishing a Data-driven, Closed-loop, Iterative Core Operational Framework

Mechanism-level integration provides the foundation for the entire model's operation, ensuring that strategic concepts are translated into sustainable and optimizable educational practices. This study proposes three core mechanisms to guarantee the effective functioning of the integrated system.

The Data-Driven Governance Mechanism [13] forms the basis of the system's information. It creates a "multidimensional integrity profile" by combining data from academic, research, and behavioural sources[14][15]. This process transforms abstract integrity competencies into quantifiable, analysable metrics. The mechanism underpins a range of assessments, from evaluations of institutional academic culture to the identification of individual risk, driving a paradigm shift in integrity education from experiential judgement to data-informed practices. The value-embedded guidance mechanism [16] focuses on effectively conveying values within the digital environment. It seamlessly integrates academic norms, ethical principles, and exemplary cases into critical platform operations via rule prompts and contextual tasks. Students absorb value guidance naturally while completing academic assignments. This mechanism emphasises the pervasiveness and continuity of educational influence, fostering the internalisation of integrity principles through practice. The optimised evaluation feedback mechanism draws on assessment models such as CIPP to construct a multidimensional evaluation system that encompasses both process and outcome [17]. This system monitors objective metrics such as thesis duplication rates, while also recognising positive changes in students' integrity, cognition, and behavioural patterns. Based on this feedback, a closed-loop management process involving monitoring, evaluation, decision-making, and optimisation is formed to continuously drive the iterative refinement of educational strategies and platform functionality.

In the context of municipal universities, these mechanisms can address the specific risks faced by their student populations. For instance, the data governance mechanism facilitates the early identification of students who frequently utilise AI tools, offering them guidance. In contrast, the value embedding mechanism incorporates professional ethics content into specialised software and design platforms, thus effectively linking academic integrity with professional competence.

2.3 Pathway-Level Integration: Establishing a Holistic Implementation Framework that Covers the Entire Growth Cycle

Pathway-level integration transforms strategic concepts and operational mechanisms into actionable implementation plans. Through systematic design, educational activities are integrated throughout the entire student development process, achieving the organic unification of integrity education and professional development. This practical framework is divided into three stages of talent development. The entry stage focuses on identity verification and internalising rules. Rigorous identity checks and interactive institutional learning establish a foundational understanding of integrity at the outset of enrolment.

The cultivation phase emphasizes behavioral modeling and capability building. Integrity requirements are embedded in coursework and research training to guide students in developing stable academic conduct norms through practice.

The exit phase reinforces the verification and recognition of academic output and its value. A combination of multidimensional technical identification and expert review is employed to promote the deep internalisation of integrity principles during final assessments.

3. Practical Pathways: Exploring a Three-Dimensional Approach Based on an Integrated Model

Building upon the "digital-enabled integrity education" integrated model, this chapter systematically constructs a three-dimensional

pathway that encompasses the entire talent development cycle, from entry to exit. This framework is based on the practical experience of sample universities. Rather than focusing on isolated technological applications, the framework translates strategic concepts and operational mechanisms into actionable educational practices. Through systematic, scenario-based design, integrity education becomes an integral part of the entire process of cultivating applied talent. The practical significance of this approach lies in translating three core principles, such as digital empowerment, value embedding, and quality orientation, into executable, monitorable, and iterable educational actions. This enhances the originality of academic outcomes and, through continuous practice and feedback within authentic academic contexts, facilitates students' internalisation of integrity norms from external requirements into intrinsic character. Thus, it provides practical support for achieving the integrated cultivation goal of high skill and high character.

3.1 Entry Pathway: Identity Verification and Rule Internalisation, and Fortifying the Foundation of Integrity Education

At the beginning of the talent cultivation process, this pathway employs digital methods to reinforce the idea that "an authentic identity is the foundation of academic integrity," thus encouraging the effective internalization of academic norms. It organically integrates biometric technology with institutional awareness processes to establish a chain of integrity transmission that extends from physical identity to digital identity and ultimately to academic identity. Specifically, the digital identity verification system uses technologies such as facial recognition to rigorously review admission eligibility in accordance with national re-verification requirements for new student enrolment. During the 2024 postgraduate enrolment eligibility review, the Ministry of Education's CHSI facial recognition service platform verified 1,300 new students, flagging only 21 cases for further manual review by the admitting faculties. This mechanism implements national admissions policies and effectively mitigates the risk of identity impersonation through technology. Furthermore, standardising verification procedures reinforces the core principle of

academic authenticity.

3.2 Process Pathway: Behavioural Modelling and Competency Development Spanning the Entire Training Chain

Throughout the training process, the focus is on addressing deficiencies in the development of preventive capabilities. Digital tools are embedded within key learning and research stages to provide support, establishing an integrated behavioural guidance system that encompasses prevention, early warning, and guidance. The "Integrity Growth Portfolio" consolidates behavioural data from students' coursework and research training in real time, providing administrators with a macro-level monitoring perspective and offering supervisors evidence for personalised interventions. Implementing intelligent plagiarism detection for competition achievements on the postgraduate research recognition platform has produced notable outcomes: application data from the past two years indicates a decline in the proportion of non-compliant achievement submissions, from 3.04% to 2.58%. This demonstrates the comprehensive effectiveness of process-based interventions in both pre-emptive risk prevention and targeted guidance. System-generated modification records serve as normative assessment criteria and learning references for students, unifying disciplinary constraints and educational functions.

3.3 Output Pathway: Outcome Review and Value Recognition, Safeguarding Quality Control

In the degree conferral process, this study established a multi-tiered review mechanism that integrates technical screening, manual assessment, and ethical deliberation. This approach reinforces academic standards through multidimensional evaluation, encouraging students to recognise the importance of integrity. During thesis assessment, the mechanism uses text duplication ratio detection for preliminary screening, with expert review at its core. This approach incorporates professional judgement from the academic community while enhancing efficiency. Implementation results indicate that the text duplication rate in the 2024 cohort of postgraduate theses decreased from 6.38% before defence to 5.87% at the graduation assessment stage, demonstrating the

effectiveness of the mechanism in promoting academic integrity. Relevant data is fed back into the training process in real-time to optimize teaching arrangements and early warning systems, forming a continuous improvement cycle of "evaluation–feedback–intervention–re-evaluation". This advances the internalisation of academic integrity from external compliance to voluntary practice in a systematic way.

4. Mechanism Safeguards: Collaborative and Optimisation Mechanisms for Deep Integration

The effective operation and continuous improvement of the practical pathway require systematic institutional support. To ensure the smooth implementation and sustainable development of the "Digital Empowerment Integrity Education" integration model, this study has established a collaborative safeguarding system comprising ethical constraints, dynamic optimisation, and full participation. The ethical constraints mechanism focuses on regulating the boundaries of technological application. By establishing data privacy protection standards and algorithmic review procedures, potential alienation arising from the use of technological tools is prevented, ensuring that digital means consistently serve the fundamental goal of education. The dynamic optimisation mechanism uses a closed-loop management system of "monitoring-evaluation-decision-optimisation" to drive the continuous adjustment and refinement of educational strategies and technological platforms based on data support. This enhances the system's responsiveness to changes in the digital environment. The whole-staff participation mechanism translates the institutional concept of "all-round education" into collaborative governance practices by clarifying responsibilities and establishing synergistic workflows. This effectively integrates educational resources. Together, these three mechanisms generate synergistic effects across three dimensions: value guidance, process operation, and stakeholder coordination. This provides a systematic and stable foundation for the deep integration of integrity education and talent cultivation.

5. Conclusions and Outlook
This study addresses the practical demands of

postgraduate integrity education in the context of digital educational transformation by proposing an integrated approach to "digital-enabled integrity education". Based on a "philosophy-mechanism-pathway" framework, the model combines technology mediation theory with the "all-round education" principle, moving integrity education from simple aggregation to systematic integration. The model provides a theoretical reference point and implementation pathways for integrity education practices in the digital age. The three-dimensional "entry-process-exit" pathway, developed based on this model and supported by mechanisms for ethical constraints, dynamic optimisation and whole-person participation, has achieved preliminary success in pilot institutions. Research indicates that, in the digital era, integrity is increasingly internalised from external norms to become a core competency, enabling individuals to navigate complex challenges and achieve sustainable development. For municipal universities, integrating integrity education systems into talent cultivation frameworks is both an essential part of their fundamental mission to foster virtue through education and a response to the demand from regional industries for trustworthy professionals.

Future research could focus on the following areas: Firstly, long-term tracking studies could be conducted to analyse the intrinsic links between integrity behaviours, academic innovation capabilities, and career development quality using longitudinal data accumulated on the platform. Secondly, comparative research could be advanced across regions, disciplines, and institutions to test the applicability and effectiveness of the integrated model in diverse contexts. Thirdly, the impact of emerging technologies, such as generative artificial intelligence, on the essence and practices of academic integrity should be considered. There is a need for active exploration of the relevant educational content and governance models to provide theoretical support and practical reference for the continuous innovation of integrity education in the digital age.

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