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TALENT DEVELOPMENT PATHWAYS IN HIGHER EDUCATION INSTITUTIONS UNDER THE GREEN TRANSITION PARADIGM

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Abstract: The comprehensive green transition of socio-economic systems has become a vital driving force and intrinsic requirement for advancing high-quality and sustainable development in China and globally. This profound socio-economic paradigm shift not only reshapes industrial structures, energy systems, and technological pathways but also imposes systemic new demands on national talent reserves. There is an urgent need for a substantial cohort of interdisciplinary, systemically minded, and sustainability-oriented composite innovators. Against this backdrop, this paper systematically analyses the current state of talent cultivation systems within Chinese higher education institutions, their phased achievements in addressing green transition challenges, and the profound challenges they face. Methodologically, this study employs comparative analysis across comprehensive, science-engineering, economics-finance, and humanities-social sciences institutions to dissect structural and systemic issues within current talent development frameworks. These include disciplinary barriers, curriculum content, industry-education integration, and faculty development. Building upon this foundation, the paper proposes a series of strategic pathways and policy recommendations across five dimensions: top-level design, core restructuring, chain integration, motivation activation, and ecosystem cultivation. These aim to deepen interdisciplinary integration, advance green reforms in curriculum systems, strengthen industry-education collaborative education models, innovate faculty and student evaluation mechanisms, and optimise policy and public discourse environments. This research aims to provide theoretical reference and practical guidance for establishing a new paradigm in Chinese higher education that proactively adapts to and effectively leads green development in future talent cultivation.
Keywords: Green transition; Talent cultivation; Higher education; Interdisciplinary integration

1 INTRODUCTION

As global climate change and environmental challenges intensify, the socio-economic transition centred on green, low-carbon and circular development has become the shared choice and core agenda for nations pursuing sustainable development[1]. This profound socio-economic paradigm shift imposes systemic new demands on national talent reserves. Higher education, as the primary arena for cultivating talent, faces critical imperatives for reform and adaptation.

Entering the third decade of the 21st century, humanity collectively confronts severe global challenges including climate change, biodiversity loss and environmental pollution. Against this backdrop, the sustainable development paradigm characterised by green, low-carbon and circular principles has evolved from a marginal environmental initiative into a global mainstream consensus and a core element of national competitiveness. The United Nations 2030 Agenda for Sustainable Development and the Paris Agreement jointly establish a green framework for global governance, propelling nations into a profound socio-economic transformation[2]. From the European Green Deal to America's Build Back Better framework, major economies have placed green development at the heart of their national strategies. Through large-scale investment in green technologies, restructuring energy systems, and reforming industrial policies, they strive to seize the high ground in the new wave of global technological revolution and industrial transformation. This global green wave constitutes a systemic transformation centred on decarbonisation, encompassing production methods, lifestyles, and even ways of thinking.

In China, the green transition is not merely an alignment with global trends but an intrinsic imperative and proactive measure for achieving sustainable national development. Since the 18th National Congress, the Central Committee has integrated ecological civilisation into the overall national development blueprint, advancing green development with resolute determination and robust measures. In 2020, China explicitly set the targets of striving to peak carbon emissions before 2030 and endeavouring to achieve carbon neutrality before 2060[3]. This constitutes both a solemn commitment to the international community and a clear green beacon for domestic economic and social development. High-quality development has been established as the foremost task in comprehensively building a modern socialist country, with green-oriented development being one of its core tenets. From the Yangtze River Economic Belt development model emphasising ecological priority and green development, to the ecological conservation and high-quality development strategy for the Yellow River Basin, and the systematic deployment in the national medium-to-long-term development plan to accelerate the green transformation of development patterns – a series of top-level strategic designs clearly demonstrate that green transformation has been deeply integrated into all levels of China's national governance. It has become one of the core drivers for optimising economic structure, deepening the energy revolution, and upgrading urban and rural development.

2 CHALLENGES AND EDUCATIONAL RESPONSES

2.1 Core Challenges: Green Transition Presents New Demands for Talent Development in Higher Education

One key factor in the success of this profound transformation—extending from superficial to fundamental levels and driven from top to bottom—lies in talent. Specialised professionals trained during the traditional industrial era, based on disciplinary division of labour, struggle to fully adapt to and master the systemic, complex challenges brought by green transition. As primary institutions for talent cultivation and vital sources of scientific and technological innovation, higher education institutions now face profound challenges and pressures for transformation in their talent development models. The green transition imposes multidimensional, profound new demands on future talent:

Complex Knowledge Structures: The green transition is not a single-domain technological innovation but a complex engineering endeavour involving multi-system coupling[4]. For instance, 'carbon finance' requires professionals to possess knowledge spanning finance, environmental science, climate policy, and data analysis; 'green building' demands architects not only master engineering techniques but also comprehend ecology, materials science, and energy management; The establishment of Environmental, Social and Governance (ESG) frameworks necessitates the deep integration of legal, managerial, financial, and environmental expertise.

Comprehensive Competency Requirements: Beyond multidisciplinary knowledge, the green transition demands a suite of advanced integrated capabilities. Foremost is systems thinking – the ability to dynamically and contextually analyse the interplay between economic development, social equity, and environmental protection across macro, meso, and micro levels, rather than addressing issues in isolation. Secondly, innovation and entrepreneurship capabilities are essential. Given the rapid iteration of green technologies and the immaturity of business models, professionals must proactively identify opportunities, integrate resources, and propose pioneering solutions. Thirdly, cross-cultural collaboration and communication skills are vital, as issues like climate change are global in nature, demanding effective dialogue and cooperation on the stage of global governance[5].

The Guiding Role of Values: The green transition is not merely a technological and economic shift but also a significant transformation at the level of values[6]. It demands that future builders and decision-makers deeply internalise and practise the concept of ecological civilisation. Consequently, the mission of higher education extends beyond imparting knowledge and skills; it increasingly centres on shaping students' values. This entails cultivating an innate reverence for nature, a sense of responsibility towards intergenerational equity, and a conscious pursuit of sustainable lifestyles.

2.2 Educational Response: Alignment with China's New Era Higher Education Philosophy

Confronted by the formidable challenges posed by the green transition, the reform and development of China's higher education system have resonated in unison with the demands of this era[7]. In this new era, the overarching design of China's higher education increasingly emphasises breaking down disciplinary barriers, promoting interdisciplinary integration, serving national strategies, and cultivating first-rate talent. Notably, the Ministry of Education's vigorous promotion of the 'Four New Initiatives' (New Engineering, New Liberal Arts, New Medicine, New Agriculture) in recent years aligns closely with the demands for cultivating green talent.

The essence of the 'Four New' initiative lies in upgrading traditional disciplines and specialisations. It aims to drive interdisciplinary convergence and industry-education integration by aligning with the demands of emerging industries and future technologies. For instance, 'New Engineering' emphasises greening traditional engineering disciplines through technological integration—incorporating artificial intelligence, big data, and smart manufacturing—to cultivate exceptional engineers capable of solving complex engineering problems. The 'New Humanities' advocates deep integration between disciplines such as history, philosophy, economics, management, and law with modern technology and societal issues, cultivating versatile talents with data literacy and a global perspective. This reform orientation—which breaks disciplinary boundaries, looks to the future, and emphasises innovation—provides top-level design support and a practical framework for systematically cultivating the talent required for green transformation.

Concurrently, the fundamental mission of Chinese higher education – fostering virtue and cultivating talent – and its overarching goal of nurturing high-calibre innovative professionals align intrinsically with the value-driven imperatives of green transition. A new generation of individuals imbued with profound social responsibility, historical mission, and innovative spirit invariably emerges as staunch advocates and active builders of ecological civilisation. Therefore, comprehensively integrating green development concepts throughout the entire talent cultivation process is not only a timely response to external demands but also an inherent requirement for deepening the intrinsic development of higher education and realising educational objectives.

3 CURRENT SITUATION AND ACHIEVEMENTS

In response to the prevailing trend of comprehensive green transformation across economic and social sectors, China's higher education institutions have proactively engaged and taken initiative. In recent years, leveraging their disciplinary strengths and institutional characteristics, universities have undertaken numerous fruitful experiments in exploring novel models for cultivating green talent. These endeavours have yielded significant interim achievements, establishing an initial multi-tiered, multi-faceted framework for green talent supply, characterised by distinct institutional features.

3.1 Comprehensive Universities: Pioneering Exploration Zones and Innovation Incubation Platforms for Interdisciplinary Integration

Leveraging their comprehensive disciplinary coverage, robust foundational research capabilities, and vibrant academic environments, comprehensive universities have pioneered top-level design and interdisciplinary integration in cultivating green talent. Their achievements are primarily manifested in:

Establishing Interdisciplinary Teaching and Research Platforms: Numerous leading comprehensive universities have taken the initiative to dismantle traditional departmental silos, establishing substantive institutes such as Centres for Sustainable Development, Schools of Ecology and Environment, and Schools of Future Technology. For instance, Tsinghua University established a research institute dedicated to the United Nations Sustainable Development Goals (SDGs)[8], while Tongji University has continuously expanded the scope of its School of Environment and Sustainable Development. These institutions integrate top-tier faculty from multiple fields including environment, energy, economics, management, and public policy, serving as core bases for conducting major interdisciplinary research and cultivating high-level, multidisciplinary talent.

Innovative interdisciplinary programmes: At both undergraduate and postgraduate levels, comprehensive universities are actively exploring the 'major + minor/dual degree' talent development model. Examples include dual-degree programmes such as 'Environmental Science and Engineering + Law/Economics', or minor micro-specialisations like 'Sustainable Development' and 'Energy and Environmental Policy' open to all students. These initiatives provide systematic green knowledge modules for students from diverse disciplinary backgrounds, enabling them to broaden their cognitive horizons while maintaining depth in their primary field, thereby constructing a T-shaped knowledge structure.

Cultivating Talent for Macro-Governance and International Cooperation: Leveraging traditional strengths in public administration, international relations, and law, comprehensive universities have nurtured numerous high-calibre professionals capable of playing pivotal roles in macro-policy formulation, regional environmental governance, and global climate negotiations. These graduates not only grasp the technical intricacies of green development but excel at analysing and resolving issues from strategic, legal, and international political perspectives. This addresses critical talent gaps in institutional and policy frameworks for green transition.

3.2 Science and Engineering Universities: The Core Force and Vital Source of Green Technological Innovation

Universities specialising in science and engineering serve as the cradle for nurturing core technological innovation and engineering practitioners driving green development, playing a pivotal role. Their contributions centre on providing critical technological underpinnings for the green transition.

Leading breakthroughs in key sectors:- In new energy fields, such as photovoltaics, wind power, and energy storage technologies; In new materials, such as high-performance catalysts and fully biodegradable materials; in energy conservation and environmental protection, including advanced industrial wastewater treatment, ultra-low flue gas emissions, and solid waste resource utilisation; and in future technologies like Carbon Capture, Utilisation and Storage (CCUS), smart grids, and hydrogen energy[9]. Through platforms such as national key laboratories and frontier science centres, these institutions have pooled research capabilities to achieve a series of major breakthroughs.

Reforming Engineering Education Models: They actively respond to the call for 'New Engineering' development, systematically integrating green, low-carbon, and circular concepts into the curriculum and entire training process of traditional engineering disciplines. By adopting advanced pedagogical approaches such as Project-Based Learning (PBL) and Design Thinking, students are encouraged to tackle real-world green engineering challenges—such as designing a zero-carbon factory or developing an intelligent energy management system — thereby cultivating their innovative capabilities and problem-solving skills for complex engineering issues through practical application.

Cultivating a Corps of Outstanding Engineers: Through deep collaboration with industry leaders, these institutions have established numerous engineering practice education centres and joint R&D platforms, producing tens of thousands of exceptional engineers proficient in green core technologies and familiar with industrial application scenarios. They form the backbone for achieving cleaner energy structures, greener industrial production, and low-carbon infrastructure.

3.3 Finance and Economics Universities: Key Drivers and Enabling Platforms for Green Economic Development

Green transition addresses not only environmental concerns but also economic imperatives. Business and economics universities have keenly recognised this shift, responding swiftly to become pivotal in cultivating specialists in green finance, sustainable management, and related fields.

Pioneering Emerging Disciplines: Responding to urgent industry demands, numerous business and economics institutions have pioneered cutting-edge programmes or modules in green finance, ESG investing, carbon trading and management, environmental accounting, and auditing[10]. They actively integrate the latest theoretical research and market case studies into their curricula, covering topics such as carbon pricing mechanisms, green bond issuance, and ESG rating system development.

Deepening Industry-Academia-Research Collaboration: These institutions proactively forge close partnerships with commercial banks, securities firms, fund management companies, carbon exchanges, and green certification bodies. Through joint laboratories, collaborative course development, and internship placements, they ensure talent cultivation aligns effectively with market demands. Graduates possess not only a solid foundation in economic and financial theory but also practical expertise in green financial product design, risk management, and market operations.

Leading Theoretical and Policy Research: Think tanks and research centres at finance-focused universities play pivotal roles in shaping intellectual discourse and providing policy advice on constructing green financial systems, designing climate finance mechanisms, and establishing corporate ESG disclosure standards[11]. They cultivate analysts and consultants who combine economic acumen with environmental understanding, delivering high-calibre decision support to governments and enterprises.

3.4 Humanities and Social Sciences Institutions: Cornerstones and Value Leaders in Building a Green Society

The green transition represents a profound societal transformation, requiring the support of institutional frameworks and cultural environments encompassing law, policy, governance, and culture. Universities excelling in humanities and social sciences play a pivotal role in laying the foundations and guiding values within this domain.

Refining Green Legal and Policy Frameworks: Disciplines such as law and public administration have cultivated numerous specialists in environmental law, energy law, and climate change policy[12]. These professionals actively contribute across legislative, judicial, administrative, and policy research spheres, offering expertise to develop a scientifically sound and comprehensive ecological civilisation institutional system.

Advancing Social Governance and Public Engagement: Disciplines such as sociology, journalism and communication studies, and psychology cultivate professionals through research and teaching on green consumption behaviour, environmental risk communication, community environmental governance models, and environmental public opinion guidance[13]. These individuals work across government, non-governmental organisations (NGOs), media, and corporate social responsibility departments, serving as vital forces in elevating societal awareness of ecological civilisation and promoting sustainable lifestyles.

Constructing Ethics and Culture for Sustainable Development: Humanities disciplines including philosophy, history, and literature provide profound ethical foundations and cultural nourishment for the green transition through deep reflection on the relationship between humanity and nature. They cultivate future educators and cultural practitioners imbued with profound humanistic concern and ecological wisdom, capable of disseminating ecological civilisation concepts within education and cultural spheres.

4 ISSUES AND CHALLENGES

Whilst universities have made commendable progress in cultivating green talent, the transformation process is not achieved overnight. Faced with this systemic, comprehensive green transition, the existing talent development framework continues to grapple with deep-seated issues and challenges. These intertwined problems collectively constitute significant constraints on the quality and efficiency of talent cultivation.

4.1 Structural Barriers: Persistent Disciplinary Silos

While interdisciplinary integration has gained consensus within higher education, traditional disciplinary barriers rooted in faculty-based units remain robust in practice. This constitutes one of the primary structural obstacles hindering the cultivation of composite green talent.

Institutional Segregation: Most universities still conduct administrative management, resource allocation, student registration, and curriculum planning at the departmental level[14]. A student from the School of Environment wishing to systematically take finance courses from the School of Economics, or a Computer Science student seeking deep involvement in the School of Agriculture's smart farming projects, often faces practical hurdles such as scheduling conflicts, mismatched prerequisite requirements, and cumbersome cross-departmental credit recognition processes. This institutional fragmentation often confines interdisciplinary collaboration to superficial resource aggregation, failing to achieve the deep integration necessary to catalyse knowledge innovation.

Limitations of the Evaluation System: The prevailing faculty assessment and disciplinary evaluation frameworks largely perpetuate single-discipline standards. Faculty promotions, research funding applications, and academic recognition predominantly hinge on publications in top-tier journals within one's discipline. This diminishes faculty motivation for engaging in interdisciplinary teaching and research activities, which are characterised by lengthy cycles, slow returns, and complex recognition processes. Similarly, discipline evaluations prioritise depth and boundaries within individual disciplines, lacking clear and universally accepted standards for measuring and attributing outcomes from interdisciplinary platforms and projects. This objectively hinders the willingness for deep, sustained collaboration between departments.

4.2 Content Lag: Slow Curriculum System Updates

Courses serve as the core vehicle for talent cultivation. However, the curricula of many contemporary universities exhibit a degree of content lag and insufficient adaptability, failing to fully keep pace with the iterative demands for knowledge and skills arising from the green transition.

Traditional Mindset in Core Courses: In core courses across many traditional engineering and business disciplines, the underlying knowledge frameworks and value orientations retain the imprint of traditional industrial civilisation. These prioritise maximising efficiency and minimising costs as primary objectives, while considerations of resource consumption, environmental impact, and social responsibility remain relatively marginalised. Green development

concepts, technologies, and business models are often treated merely as supplementary modules rather than being systematically embedded within the core knowledge structure. This approach fails to fundamentally reshape students' foundational knowledge and cognitive paradigms.

Shortage of cutting-edge teaching content: New knowledge, technologies, and business models within the green transition domain evolve rapidly — examples include distributed energy storage, synthetic biology, ESG rating methodologies, and climate risk analysis models. However, transforming these cutting-edge developments into high-quality courses, textbooks, and teaching cases demands a complex and time-consuming process. Currently, universities generally lack comprehensive, high-quality, and systematic teaching resource repositories reflecting China's domestic green transition practices. Educators often encounter difficulties in accessing quality localised teaching materials.

4.3 Practical Disconnect: Insufficient Industry-Academia Integration

The cultivation of green talent particularly emphasises practical capabilities and problem-solving skills, yet this is precisely the area where higher education currently needs strengthening. The issue of insufficient depth in industry-education integration is notably pronounced.

Mismatched and superficial practical platforms: On one hand, many universities' internship and practical training bases remain predominantly concentrated in traditional industrial sectors. High-quality platforms offering students practical opportunities in cutting-edge green industries such as new energy, new materials, green finance, and smart environmental protection are limited in number and scarce in availability. Concurrently, existing university-enterprise collaborations often remain superficial, confined to ceremonial partnerships, brief visits, or non-core internship placements[15]. Consequently, students rarely engage in core business processes such as green technology R&D, green management innovation, or green strategic decision-making within enterprises, undermining the effectiveness of practical education.

Lagging development of dual-qualified teaching staff: Formulating talent cultivation programmes, developing course content, and guiding practical projects all require substantial numbers of dual-qualified teaching staff possessing both solid theoretical foundations and rich industrial practical experience. However, the current composition of university teaching staff remains predominantly research-oriented. While proficient in theoretical inquiry, they may lack in-depth understanding of the latest industry developments and practical demands. Concurrently, incentive mechanisms and institutional pathways to attract high-calibre industry experts for deep engagement in university teaching remain underdeveloped, creating barriers to talent exchange and knowledge circulation between academia and industry.

4.4 Orientation Bias: Ambiguity in Social Perception and Career Pathways

Talent cultivation constitutes a holistic ecosystem where societal perceptions and career prospects at the output stage directly influence the quality of incoming students and their motivation at the input stage.

Misconceptions in Society and Among Students: Despite green development being a national strategy, the image of 'green professions' remains relatively vague or even subject to prejudice in the public consciousness, including among many students and parents. Certain environmental and ecological disciplines continue to be stigmatised as 'unpopular' or lacking clear employment prospects, making them less attractive compared to hot fields like finance or computing. This cognitive bias may deter top-tier applicants, undermining the foundational calibre of the green talent pool.

Uncertainty in Career Pathways: For many emerging interdisciplinary green roles, such as 'carbon asset manager,' 'ESG analyst,' and 'sustainability director,' professional standards, competency requirements, and promotion pathways are still being explored and developed. There is a lack of clear, stable, and predictable career roadmaps. This uncertainty may leave students feeling disoriented when choosing their majors and planning their futures, potentially steering them towards more traditional and established career fields.

5 PATHWAYS AND COUNTERMEASURES

To systematically address these challenges and establish a higher education talent cultivation system that resonates with the green transition while enabling forward-looking strategic positioning, it is imperative to implement systematic and collaborative reform measures. The following strategic pathways and countermeasures are proposed across five dimensions: top-level design, core restructuring, chain integration, motivation activation, and ecosystem cultivation.

5.1 Top-level Design: Establishing Institutional Safeguards for Interdisciplinary Integration

To dismantle disciplinary barriers, institutional restructuring and innovation must commence at the highest level of university governance, providing robust organisational and policy safeguards for interdisciplinary integration.

Redesigning organisational structures to establish integrated entities: Universities with the capacity should draw upon the experience of world-leading institutions to establish substantive or matrix-based interdisciplinary teaching and research bodies, such as the 'Future Academy for Sustainable Development' or the 'Institute for Environmental and Social Cross-disciplinary Sciences'. Such bodies should be granted special status transcending traditional faculties, possessing autonomous authority over admissions, curriculum design, and faculty recruitment. They should effectively coordinate high-quality resources both within and beyond the institution, concentrating efforts on delivering

interdisciplinary degree programmes and core courses. These entities will serve as demonstration zones and core drivers for advancing disciplinary integration within the university.
Establishing Credit Transfer Mechanisms to Empower Self-Directed Learning: Implementing more flexible, open systems for cross-faculty course selection and credit recognition across the entire university. Implement a 'credit bank' model, permitting students to freely select course modules related to green development from different faculties, guided by their supervisors and aligned with their interests and career plans, with these credits counting towards their total requirements. By lowering institutional barriers, this encourages students to proactively construct personalised knowledge structures reflecting their unique strengths and oriented towards green development, transforming passive learning into active knowledge construction.

5.2 Core Transformation: Advancing Green Reform of the Curriculum Framework

As the primary arena for talent cultivation, the curriculum necessitates systematic green transformation, deeply embedding sustainable development principles throughout the knowledge transmission process.
Establish a dual-tier system of 'green general education' and 'professional integration': Firstly, offer a high-quality, advanced compulsory core course in 'Sustainable Development' or 'Ecological Civilisation' to all undergraduates, regardless of their disciplinary background. This aims to shape a shared green value system and knowledge foundation among all students. Secondly, within each discipline, promote the integration of green content as an intrinsic element rather than an optional external module. For instance, finance curricula should incorporate green finance and ESG investing; materials engineering should cover life cycle assessment; marketing should explore green marketing and corporate social responsibility; and urban planning should be underpinned by concepts of resilient cities and low-carbon communities.
Jointly building and sharing cutting-edge 'case libraries' and 'textbook repositories': Led by the Ministry of Education or industry associations, collaborate with universities, research institutes, and leading enterprises across relevant fields to jointly develop, evaluate, and promote a collection of cutting-edge teaching cases reflecting China's latest green transition practices. These cases should be timely, locally relevant, and in-depth, helping students understand complex real-world challenges and innovative solutions. Concurrently, high-calibre teaching teams should be encouraged and supported to author and publish a series of innovative, interdisciplinary textbooks integrating green development principles.

5.3 Bridging the Gap: Deepening Industry-Education Collaboration in Talent Development

To bridge the theory-practice divide, industry must be more deeply integrated into core talent development processes, establishing a collaborative ecosystem characterised by deep integration, shared risk, and mutual benefit.
Establishing Modern Industry Academies: Universities should collaborate with leading enterprises or industrial parks in sectors such as new energy, high-end environmental equipment, green financial services, and circular economy to establish distinctive 'Modern Industry Academies'. These academies should function as integrated entities combining talent cultivation, technological innovation, and social services. Universities and enterprises should jointly formulate training programmes, develop curricula, assemble teaching teams, and build practical platforms to achieve seamless, integrated coordination across the entire chain from recruitment and training to employment.
Comprehensive Implementation of Dual-Mentorship and Project-Based Learning: For students entering industrial colleges or participating in major industry-academia-research collaborations, a dual-mentorship system should be fully implemented. This involves guidance from both academic mentors within the university and industry mentors from enterprises. Academic mentors focus on imparting theoretical knowledge and research methodology training, while industry mentors concentrate on developing practical skills and broadening industry perspectives. Concurrently, project-based teaching rooted in genuine industrial needs will be vigorously promoted, enabling students to gain experience and develop through project-based learning that addresses real-world industrial challenges.

5.4 Motivational Activation: Innovating Faculty Development and Student Assessment Mechanisms

The deepening of reform ultimately hinges on human motivation. Transformative changes to the evaluation system are required to activate the intrinsic drive of both faculty and students in green talent cultivation.
Reforming the Faculty Evaluation and Development System: In faculty title assessments, position appointments, and performance evaluations, it is essential to move beyond the singular reliance on academic publications as the sole criterion. Instead, the following should be explicitly recognised as equally important evaluation indicators: achievements in interdisciplinary teaching (such as developing and delivering cross-disciplinary courses, or compiling interdisciplinary textbooks); the effectiveness of guiding students in green innovation and entrepreneurship projects; and contributions to the green development of local communities and industries. Concurrently, establish dedicated funds to support faculty in undertaking cross-disciplinary visits, training, and corporate secondments, systematically enhancing their interdisciplinary teaching capabilities.
Establishing a Diversified Student Assessment Framework: Shift away from reliance on summative examination results as the primary basis for student evaluation, establishing a more comprehensive, process-oriented, and multi-faceted assessment system. Include students' achievements in green innovation competitions, service experience within environmental NGOs, completion of high-quality course projects on sustainable development themes, and innovative

performance during internships and practical placements within their comprehensive quality assessment portfolios. Assign corresponding credits or weightings to these elements. This approach will guide students towards proactive exploration and holistic development, moving away from passive exam preparation.

6 CONCLUSION

The comprehensive green transformation of the economy and society represents both a vital pathway for China to achieve high-quality development and an imperative of our era in addressing shared global challenges. This profound transformation poses a central question for higher education: how to cultivate a new generation of talent capable of shouldering the responsibility of building a sustainable future? Through examining the current state of talent cultivation in Chinese universities, analysing existing challenges, and exploring potential pathways, this study reaches the following conclusions:

Presently, China's higher education system has demonstrated proactive adaptability and initial effectiveness in serving the green transition, establishing a fundamental framework where diverse types of institutions collaborate synergistically. However, confronting the green transition's composite and systemic demands for talent knowledge, capabilities, and values, the existing talent cultivation system still faces deep-seated institutional and systemic obstacles in disciplinary structure, curriculum content, industry-education integration, faculty capacity, and societal perception.

To effectively address these challenges, universities must undertake a systemic reform centred on deep integration. This entails more than merely adding new disciplines or courses; it requires: - Reconstructing organisational safeguards through top-level design; - Achieving comprehensive greening of the curriculum through core restructuring; - Establishing collaborative education communities by bridging industry-education chains; - Activating innovation through internal evaluation and incentive mechanisms. Simultaneously, the success of this reform necessitates collaborative support from government, industry, and society at large to collectively foster an ecosystem that reveres sustainability and encourages innovation.

Looking ahead, higher education's role in the green transition will become increasingly pivotal. It must evolve beyond being merely a transmitter of knowledge and supplier of talent, instead becoming an advocate for green principles, a source of green technological innovation, and a think tank guiding society's sustainable development. Through sustained, deepening and systematic reform, China's universities stand poised to cultivate multitudes of green talents equipped with systems thinking, innovative spirit and global vision. This will provide an uninterrupted flow of human capital and intellectual contributions to the noble endeavours of building a Beautiful China and advancing sustainable human development.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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