# Research on the Training Strategy of Innovation Ability of New Engineering Talents with Urban Construction Characteristics under Digital Intelligence

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Abstract: To cultivate and develop highquality productivity, innovation is a core element. Currently, a new wave of scientific and technological revolution, along with an industrial revolution, is emerging, with significant scientific and technological innovations driving transformative changes in social production. Digital intelligence encompasses new technologies characterized by big data and advanced intelligence. The development of technologies such as the artificial Internet and intelligence is continually reshaping the educational landscape. The traditional urban construction engineering discipline no longer meets the demands of the urban construction industry in this new era. By examining the current state and challenges regarding the innovative capabilities of new engineering talents in traditional urban construction, this paper outlines training strategies aimed at enhancing these capabilities in alignment with urban construction characteristics within the context of digital intelligence. The proposed strategies include: first, promoting the development of interdisciplinary and multidisciplinary fields: second. implementing diverse teaching methods based on modern information technology; third, establishing an intelligent and educational innovation platform grounded in data elements. This study offers a fresh perspective on cultivating the innovative abilities of new engineering talents with urban construction characteristics in the age of digital intelligence, thereby providing support for the essential ongoing development of industrial innovation in China.

Keywords: Digital Intelligence; Urban Construction; Characteristics of New Engineering; Innovation Ability

# 1. Introduction

In February 2017, the Ministry of Education issued the Notice of the Higher Education Department of the Ministry of Education on the Research and Practice of "New Engineering" (Jiaogao Sihan No.6), which outlined a clear demand for the cultivation of new engineering talent and provided corresponding policy recommendations<sup>[1]</sup>. The Ministry of Education of China put forward concept of "new engineering" the construction for the first time, marking the start of the reform of new engineering education. In 2023, the Ministry of Education announced the list of the first batch of "new engineering" research and practice projects. which included numerous initiatives related to smart cities, intelligent construction, green buildings, and other urban development projects. This further clarified the key directions and implementation pathways for new engineering construction.

The introduction of the new engineering concept has profoundly impacted on the traditional urban construction sector. It represents not only an innovation in engineering technology education but also a crucial driving force for promote the transformation and upgrading of the urban construction industry, addressing the needs of future urban development. In the context of industrial transformation and guided by the demand for skilled professionals, this paper explores strategies for cultivating digital and innovative new engineering talent, It leverages this opportunity to advance the digital transformation of the construction industry, foster a positive interaction between talent development and industrial growth, and ultimately facilitate China's transition from a "manufacturing power " to a "manufacturing power " and a " digital power"<sup>[2]</sup>.

New engineering emphasizes interdisciplinary integration and innovation, significantly impacting talent education in the field of urban construction. This interdisciplinary educational model cultivates individuals with

comprehensive skills and innovative capabilities essential for urban development. The new engineering education approach prioritizes the development of practical skills and innovative thinking. By enhancing practical training opportunities, incorporating project-based learning, and emphasizing innovation and entrepreneurship education, students can develop their innovative thinking and practical abilities while addressing realworld challenges. The new engineering paradigm in urban construction is gradually transforming the traditional sector, steering the industry toward a more intelligent, green, and sustainable future. Simultaneously, it establishes new requirements for practitioners' competencies and fosters innovation and development across the entire industry.

# 2. The Current Situation and Problems of Cultivating the Innovation Ability of New Engineering Talents in the Traditional Urban Construction Category

#### 2.1 Status Quo of Innovation Ability Cultivation of New Engineering Talents in Traditional Urban Construction Category

2.1.1 Status of the education system and training concepts

As an essential field of engineering and social urban building education growth, is continually adapted to the pace of social progress and industrial advancement. However, the basic structure of the old urban building education system demonstrates rigidity and slow responsiveness to new concepts. This reflects the limitations of traditional urban construction education's organizational structure before the implementation of the new engineering education model, specifically the absence of a long-term, endogenous driving force mechanism to promote interdisciplinary integration and innovative practice. At present, the organizational management, power, and responsibility configuration at the meso level of many universities are not flexible enough to adapt to the complex requirements of crossdisciplinary integration and technological innovation brought about by the construction of new engineering disciplines, indicating that there is still much room for the optimization of the internal structure of universities and their management mechanisms to promote the transformation.

2.1.2 Status of curriculum and teaching content The training of new engineering talent's innovation ability in traditional urban construction is gradually being integrated into interdisciplinary courses, with a focus on the combination of theory and practice, as well as the enhancement of practicability through project-based learning and school-enterprise collaboration, among other things. However, it continues to face sluggish curriculum updates. poor interdisciplinary integration, and unequal distribution of practical resources. In terms of teaching content innovation and adaptability, the curriculum is frequently more fixed, with a lack of fast reaction and incorporation of developing technology and novel examples, making it harder to pique students' interest in exploration and creativity. Training objectives, curriculum, and instructional content are overly theoretical and fail to properly engage creativity <sup>[3]</sup>. The curriculum's students' updating rate falls behind the rapid development of industry technology, and the integration of old knowledge from traditional urban construction classes with the new engineering system is insufficient, resulting in a disconnect between students' learning content and practical application.

2.1.3 Practical ability and innovation training status quo

At present, some of China's traditional urban construction colleges and universities are still stuck in the teaching mode based on the division of specialties and subject knowledge, while neglecting the cultivation of students' innovation and application ability. Under the traditional system, the professional courses in urban construction are a key indicator for evaluating the quality of students, but if the school and the enterprise cannot be closely connected and do not focus on the practical operation, it will result in the disconnection between the theoretical knowledge learned by students and the practical application, and cannot adapt to the requirements of the new engineering discipline for innovative talents <sup>[4]</sup>. In terms of innovation training, although the school encourages students to participate in scientific research projects. innovation competitions, and other activities, the innovation atmosphere and incentive reward mechanism are not yet perfect, and the student's willingness and motivation to innovate need to be further improved, and

there are limited resources for practice uneven opportunities platforms. for interdisciplinary practice, and the evaluation system of innovation ability also needs to be improved.

#### 2.2 Analysis of the Problem of the Innovation Ability of New Engineering Talents the Traditional Urban in **Construction Category**

2.2.1 Disconnection between policy orientation and industrial development

The disconnection between policy orientation and industrial development leads to an obvious gap between talent training and market demand. The current national policy focuses more on cultivating students' technical ability, such as mastering BIM, GIS, and other software, and pays insufficient attention to innovative thinking and problem-solving ability, which leads to the fact that colleges and universities still focus on imparting knowledge and skills and lack effective cultivation of students' innovation ability in terms of curriculum, teaching content, and construction of teaching staff. The national level lacks specific policy guidance and resource inclination for the cultivation of new engineering talents in traditional urban construction, and although some documents emphasize the construction of new engineering disciplines, there is a lack of detailed measures for the urban construction industry, which leads to some colleges and universities still staying in the traditional mode in terms of cultivation objectives and teaching contents, and it is difficult to effectively stimulate the innovation potential of students. The development mode of China's urban construction industry is still dominated by the traditional way, the lack of application and promotion of new technologies and new modes, some urban construction enterprises and projects are still stuck in the traditional technology and management mode, and the lack of investment in the research and development of new technologies bv enterprises leads to the lack of technological innovation ability, and it is difficult to carry in-depth industry-academia-research out cooperation with colleges and universities, which hampers the enhancement of the innovation ability of the talents in new engineering disciplines<sup>[5]</sup>.

2.2.2 Slow updating of the curriculum content system

The slow updating speed of the curriculum content system makes it difficult to meet the needs of emerging technologies and industrial development. With the development of science and technology, especially the rise of new engineering disciplines, the development of cross-fertilization between engineering fields has become a trend <sup>[6]</sup>. However, at present, China's urban construction engineering education follows the original curriculum system, with strong barriers between disciplines, and the curriculum reform is limited to the internal curriculum and lacks the depth of interdisciplinary integration. For example, in emerging fields such as smart city construction and intelligent construction, it is integrate multidisciplinary necessary to knowledge such as architecture, urban planning, civil engineering, computer science, artificial intelligence, etc., and the existing teaching materials are old and narrow in content, lacking in cutting-edge knowledge and technology of the discipline, such as in emerging fields such as BIM technology, digital twin, intelligent transport, etc., the content of the teaching materials is slow in updating, and it is unable to timely reflect the latest technology and application development trend. In terms of course content setting, following the logic of the development of the discipline and ignoring the individual cognitive laws of students, the traditional 'ladder type' course curriculum results in the separation of theoretical knowledge and practical knowledge, which is not conducive to the application of theoretical knowledge in practice and innovative exploration.

2.2.3 Lack of effective innovation practice platforms and opportunities

The lack of effective innovation practice platforms and opportunities restricts the cultivation and enhancement of students' innovation abilities. The construction of new engineering disciplines requires the cultivation of senior engineering talents with solid engineering practice ability, engineering design ability, and engineering innovation ability to support the development of new industries and enterprises <sup>[7]</sup>. The innovation practice platform is a necessary condition for the cultivation of the innovation ability of engineering talents in urban construction. In

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the process of development, influenced by the traditional teaching concept, there is a longterm problem of focusing on theoretical teaching and light on practical teaching, the innovative practice lack of platforms, insufficient engineering practice training for students, and the lack of outstanding innovation ability. The lack of an innovative practice platform is mainly reflected in the following aspects: First, the construction of an on-campus practice platform is relatively weak, and there is a lack of advanced technical instruments and equipment provided to students for innovation training. Secondly, the university-enterprise cooperation mechanism is not perfect, and students lack the opportunity to hone their practical skills in real engineering projects. The lack of effective communication mechanisms and collaboration between colleges and enterprises makes it difficult to transform scientific research results into practical applications, which hinders the enhancement of students' innovation ability.

# 3. Characteristics and Requirements for Cultivating Innovative Capabilities of New Engineering Talents with Urban Construction Characteristics under Digital Intellectualization

# **3.1** Characteristics of Innovation Ability Cultivation of New Engineering Talents with Urban Construction Characteristics under Digital Intellectualization

3.1.1 Characteristics of digitalization

The economic form based on new engineering education with urban construction characteristics is the digital economy, and the product form is based on industrial digital intelligence and digital industrialization. The digitalization of the cultivation of innovation ability of new engineering talents with urban construction characteristics is reflected in the following: the digitalization first, of technology applications. The application of new engineering science involves a large number of digital intellectualization technologies, such as big data analysis, cloud computing, artificial intelligence, etc., which not only changes the traditional working mode of the urban construction industry but also improves the efficiency and accuracy of work<sup>[8]</sup>. For example, through big data analysis, urban development trends can be predicted

more accurately, and urban planning can be optimized. Second, the digital intelligence of educational content. The educational content of new engineering disciplines with urban construction characteristics also shows the trend of digital intelligence, and urban construction colleges and universities increase courses related to digital intelligence, such as data science and information security, in the curriculum of relevant majors to cultivate students' ability to master digital technology and application. Third, the digitalization of practical links. In the experiments, practical training and other practical aspects of urban construction characteristics of new engineering disciplines use a large number of digital technologies and tools, such as the use of virtual reality technology for simulation experiments, so that students can carry out urban construction design and planning in a virtual environment to improve their practical ability.

3.1.2 Cross-integration of disciplines

Urban construction specialties have the characteristics of interdisciplinary crossresearch common to both engineering disciplines, and this characteristic is more significant in the digital age through in-depth exploration of the development of urban construction disciplines<sup>[9]</sup>. New engineering education in urban construction requires mastery of theories and methods such as BIM technology, smart city management, green building, and other advanced technologies. Under the current development trend of science and technology and education, the new engineering education with urban construction characteristics is no longer limited to the traditional civil engineering and urban planning fields but actively absorbs and integrates the knowledge and technology of information technology, environmental science, data analysis, innovative design, and other multidisciplinary knowledge and technology and continuously integrates cross-disciplinary theories and methods to enrich the connotation and extension of its research, while the correlation and penetration between the two is even more, and the trend of cross-research is even closer. The trend of cross-research is more obvious. Specifically, the introduction of BIM technology, smart city management, green building, and other advanced technologies requires talents in the field of

urban construction not only to have solid basic knowledge of their specialties but also to have the ability to interdisciplinary learning and application. For example, in smart city construction, it is necessary to use information technology, data analysis, and other means to optimize urban management and services; in green building design, it is necessary to combine the knowledge of environmental science, material science, and other knowledge to achieve energy savings, environmental protection, and sustainability of buildings. Therefore, grasping this feature of crossfertilization of new engineering disciplines construction characteristics with urban provides strong support for cultivating talents with comprehensive ability and innovative spirit, which will help the future innovative development of urban construction colleges and universities.

3.1.3 Collaborative innovation

Throughout the development of scientific history, scientific research echoes the development of the times, and the content and methods of urban construction class new engineering research are also similarly synergistic with the development of the age of digital intelligence and changing needs. The first is the synergistic development of digital intelligence technology, new computer science and technology, new data processing means, and other theories and methods involved in the current urban construction disciplines, which provide an important source of knowledge for data analysis, artificial intelligence, cloud computing, and other cutting-edge technologies related to scientific research and application, and the synergistic development of the characteristics of the increasingly clear. Second, at the macro level, the development of engineering disciplines with urban new construction characteristics is also influenced by national policies, the social environment, and innovation needs in real-time. The establishment and funding direction of the fund projects each year often reflect the current hot issues and market demand, which also provides important direction guidance for new engineering education. Therefore. new engineering education with urban construction characteristics must pay close attention to the trend of the times and policy guidance, adjust the teaching content and methods in time, continue to play the advantages of

collaborative innovation and ensure that the results of talent training are timely, advanced, and innovative.

# **3.2** Requirements for the Cultivation of Innovation Ability of New Engineering Talents with Urban Construction Characteristics under Digital Intelligence

3.2.1 Possessing a digital-intelligent

curriculum system

In the context of the era of digital intelligence, enterprises need applied and compound talents that can help them create value and solve complex problems. With this background as a guide, colleges and universities should take the traditional courses as the basis of the urban construction course system, integrate the digital intelligent courses, combine the courses with other traditional courses. reconstruct the course system, establish a diversified course system based on the three major modules of "traditional courses + information courses + urban construction courses," and build a multi-level practical teaching mechanism and course quality assurance measures<sup>[10]</sup>. Teaching mechanisms and program quality assurance measures. Urban construction colleges and universities should be guided by the national and local industrial demand for the development of a digital economy, formulate the top-level design of the "Intelligence +" crossfertilization curriculum system, reshape the training program for new engineering talents in urban construction colleges and universities, formulate the top-level design of the curriculum system, and offer courses on artificial intelligence, data principles, and methods, smart city planning and design, BIM technology and digital urban infrastructure management as compulsory courses, to enhance the intelligent professional literacy of students in urban construction colleges and universities, improve their ability to apply data and enhance the employment competitiveness and career competence of students in urban construction colleges and universities.

3.2.2 Possess interdisciplinary, comprehensive literacy

With the continuous development and of technology, the urban integration construction involves class field multidisciplinary intersection, and interdisciplinary comprehensive literacy has become the most important basic literacy for urban construction college students to be able to adapt to the requirements of the intelligent era. Therefore. urban construction professionals should know materials science engineering, electronic information and engineering, computer science and technology, mechanical design and manufacturing and automation, and other types of disciplines, to establish a reasonable multidisciplinary knowledge structure and broad knowledge vision, both horizontal and comprehensive knowledge, and have the knowledge base of digital intelligence, a basic understanding of digital intelligence knowledge and the ability to use it, and a good grasp of big data, cloud computing, Artificial Intelligence and other intellectualization digital technology equipment operation essentials and rich practical experience. The interdisciplinary knowledge structure can help to effectively communicate and collaborate with people of different specialties in urban construction projects, solve complex problems, and provide solutions innovative for intelligent construction in the era of digital intelligence. 3.2.3 Possessing "macro thinking" and

integrated innovation ability

In the era of digital intelligence, the cultivation of new engineering talents with characteristics of urban construction with "macro thinking" and innovation ability is an inevitable requirement to adapt to the latest trend of urban construction and development, aiming at cultivating compound talents who can not only think about the problems of urban construction at a strategic level but also have the spirit and ability of innovation. Macro-thinking requires new engineering talents to have a broad vision and deep insight and to be able to think about urban construction issues from a global and long-term perspective. In the era of digital intelligence, urban construction faces many challenges and opportunities and requires comprehensive consideration of economic, social, environmental, and other factors. Therefore, innovative talents should have a global vision, with the ability to distill simplicity from complexity and grasp the wholeness of thinking, to quickly see the essence of things and effectively seek ways to solve problems. At the same time, urban construction colleges and universities can actively cultivate innovation consciousness

and innovation ability by offering innovation courses, organizing innovation competitions other diversified wavs. mastering and interdisciplinary knowledge, understanding the development trend of different fields, integrating such knowledge, integrating the knowledge and technology of different disciplines in depth through the comprehensive use of cross-disciplinary theories and methods, and carrying out innovative integration to construct a more advanced and comprehensive The aim is to build a more advanced and comprehensive technological structure system to respond to the increasingly complex and specific urban construction problems in a targeted manner.

# 4. Training Strategies for New Engineering Talent with Urban Construction Characteristics in the Context of Digital Intelligence

# 4.1 Promote the Development of Interdisciplinary and Multidisciplinary Fields

Revised Text: To promote the development of interdisciplinary and multidisciplinary fields, construction universities urban should implement a series of measures to transcend traditional disciplinary boundaries and transform their talent training models. First, it is essential to establish an interdisciplinary curriculum system. Colleges and universities should design and offer a range of interdisciplinary courses that encompass computer science, materials science. environmental science, and other relevant fields, integrating them deeply with urban construction majors. This approach will provide students with a broader knowledge base and more comprehensive skills training. enabling them to better understand and address problems. Additionally, complex the curriculum should be continuously updated, incorporating modules or units related to digital intelligence into urban construction courses. Examples include intelligent building design, urban data analysis, and smart city management, which will help students grasp the application of digital technology in urban construction. Second, it is crucial to strengthen the development of interdisciplinary research teams. Colleges and universities should encourage and support the formation of these

teams to conduct research in areas such as green buildings, smart cities, and intelligent transportation. By fostering collaboration and exchange among different disciplines, institutions can enhance the output and application of scientific research findings, providing robust support for industry advancement. Third, an innovative talent training model should be developed. To cultivate future-oriented, multidisciplinary professionals with an innovative spirit, a training model based on the cross-integration of various professional groups should be established. By integrating architecture, urban and rural planning, construction management, and other related disciplines, a systematic urban and rural construction professional group can be formed. This coordinated development among disciplines will facilitate cross-integration deep and mutual enhancement.

# 4.2 Promote the Adoption of Multi-Dimensional Teaching Methods Utilizing Modern Information Technology

The development of modern information technologies, such as the Internet, big data, and artificial intelligence, has made teaching more accessible, personalized, and contemporary. integration of these The technologies emphasizes the application of big data and cloud computing in classroom teaching reform, leading to a more profound transformation in knowledge transfer methods. This approach provides students with diverse and personalized learning experiences. Ultimately, it culminates in the formation of a "cloud+ network +end" computing, network information technology, big data, and artificial intelligence serve as the foundational structure. The Internet acts as the primary medium, while terminal technologies such as virtual reality (VR), mobile clients, electronic screens, and mobile devices facilitate interaction with learners. Modern information technology can first be applied to online learning and virtual experiments within a multi-teaching model. By utilizing online learning platforms and virtual experiment systems, students can learn anytime and anywhere, enhancing the flexibility and autonomy of their education. For instance, virtual reality technology can accurately simulate various scenarios in urban planning and construction, allowing students to

engage in practical operations and exercises that deepen their theoretical knowledge and improve their practical skills. Additionally, multimedia teaching resources can be incorporated into the teaching process. By integrating text, images, audio, video, and other forms of information, educators can provide students with a variety of resources. These may include background knowledge related to course content, interpretations of professional terminology, case analyses, and other textual materials. High-definition urban planning maps, architectural design schematics, and construction site photographs can serve as visual data. Audio files related to the course content, such as urban noise analysis and explanations of architectural design concepts, can also be utilized. Furthermore, teaching documentaries. and engineering videos. practice videos related to the course can be introduced, enabling students to intuitively grasp the practical applications of urban construction and planning.

# 4.3 Promote the Development of an Intelligent Educational Innovation Platform Grounded in Data Elements

Intelligent education innovation platform is essential for establishing a digital intelligence framework for new engineering disciplines. Developing a digital intelligence training platform tailored to urban construction is a crucial tool to support students ' innovation and entrepreneurship projects. Urban construction universities can progressively create a new engineering teaching platform characterized by high integration and expansion through collaboration with enterprises, companies, and other institutions that possess rich industrial and educational resources. The development of a unified teaching management platform should be grounded in data elements, which will serve as the foundation for creating an online intelligent education innovation platform. This platform will not only provide students with the necessary data and information but also clean, organize, and analyze the collected data. After filtering the data, it will integrate information technology with urban construction expertise to simulate a real-world practice environment. Building a smart platform and service environment is a significant strategic task for urban construction universities. For both teachers and students,

the intelligent education innovation platform, based on large-scale Internet collaboration, serves as a vital tool for open sharing of resources, facilitating information dailv teaching and learning. The platform features an concise, and comprehensive intelligent, teaching search module. By analyzing the search content input by teachers and students, it can accurately calculate the knowledge base, subject tendencies, cognitive characteristics, emotional preferences, and potential abilities of the individual being searched. This capability allows the platform to swiftly meet the information needs of users, fostering a virtuous cycle of information collection and processing, improve students ' learning efficiency, and promote the" side by side" of mathematical intelligence with urban construction knowledge optimization.

# 5. Conclusion

This study first analyzes the current situation and challenges in cultivating the innovative abilities of new engineering talents within traditional urban construction. It examines the characteristics of cultivating innovative abilities in new engineering talents that are specific to urban construction under the framework of logarithmic intelligence. Furthermore, it outlines the requirements for fostering these innovative abilities in new engineering talents within the context of digital intelligence. Secondly, the study formulates training strategies for enhancing the innovative abilities of new engineering talents with urban construction characteristics under digital intelligence, focusing on aspects such as discipline development, teaching method reform, and platform construction. This approach offers valuable insights for cultivating new engineering professionals who can adapt to modern developments and possess strong practical skills.

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