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Research on Digital Empowerment of Integrated Development of Education, Science and Technology and Talent in Universities

Yang Liu

Zhengzhou Normal University, Zhengzhou, Henan, 450044, China

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Abstract: With the continuous emergence of technologies, digitalization has become a key driver of educational reform. From online courses to the advent of various intelligent tools, digitalization is reshaping educational models. Data shows that by 2024, the global online education market size reached approximately $370 billion, with a year-on-year growth of about 20%. An increasing number of universities are adopting digital technologies to break through time and space constraints and meet students' digital learning needs. This paper focuses on analyzing the integrated development of digital empowerment in higher education technology talent. It first examines the current status of integrated development in higher education technology talent, explores the significance of digital empowerment in this field and existing challenges, and proposes targeted strategies such as strengthening digital infrastructure construction and promoting digital teaching and research models, aiming to provide reference for relevant professionals.

1. Introduction

Digital empowerment in education has given rise to innovative pedagogical models, with flipped classrooms and blended learning being prime examples of digital-driven educational innovations. These approaches not only enhance equitable resource distribution but also boost the effectiveness of talent development. In this context, the integrated development of educational technology professionals has emerged as a new frontier in education. While many educators now recognize the importance of digital tools, challenges persist in their application due to difficulties in adapting teaching methodologies and technical tools. This underscores the critical need to explore how digital empowerment can drive the integrated development of educational technology professionals in higher education, enabling institutions to better seize opportunities and achieve sustainable growth.

2. The Present Situation of the Integrated Development of Higher Education and Science and Technology Talents

China is currently undergoing a critical transformation phase in the integrated development of scientific and technological talent in higher education. From the perspective of work outcomes, the disciplinary layout has been further refined, with most universities establishing interdisciplinary

programs. Focusing on cutting-edge industry trends such as AI and green energy storage, they are building a new educational system that "centers on fundamental disciplines while leveraging interdisciplinary breakthroughs." On the one hand, industry-education integration has deepened through initiatives like school-enterprise partnerships and dual-teacher systems, closely aligning academic research with industrial demands. Many research achievements have already been applied in frontline work. On the other hand, technological support has significantly increased, with universities receiving a higher proportion of national science and technology awards, becoming a source of breakthroughs across various fields and providing favorable conditions for technology transfer. However, challenges persist in this development process. First, traditional institutional mechanisms still constrain operational details, such as difficulties in resource integration. Second, educational planning remains disconnected from industrial needs, lagging behind developed countries. Third, evaluation systems emphasize theory over practice. Fourth, insufficient application of digital technologies. These issues may hinder the integrated advancement of this initiative.

3. The Significance of Digital Empowerment in the Integrated Development of Higher Education Technology Talents

The primary focus is to enhance educational quality and efficiency. Traditional education models often operate as one-way information delivery systems that fail to address students' diverse learning needs. Digital transformation, however, enables personalized learning experiences. Take Coursera's online platform as an example: Coursera's online platform, by integrating web analytics, delivers course recommendations based on students' historical learning preferences. Compared to conventional teaching methods, this targeted learning approach and resource recommendation system can boost learning efficiency by 30%. It allows students to maintain steady progress at their optimal pace while fostering self-motivation through customized learning experiences.

Secondly, it facilitates technological innovation and breakthroughs. Currently, we are in a period of explosive data growth, where researchers need to conduct in-depth mining of massive information during experiments, observations, and simulations to uncover underlying patterns and support subsequent scientific research. In the past, such data analysis was challenging, but with the empowerment of digital technologies, big data analysis can rapidly integrate and collect data, leveraging intelligent algorithms for in-depth analysis, thereby shortening the research cycle. For instance, during drug development, when faced with vast amounts of clinical trial data and patient data, big data can be utilized to screen potential drug targets and candidate drugs, thereby improving the success rate of drug development.

Finally, optimizing talent cultivation and development. In the digital era, universities can conduct multi-dimensional data analysis of students to gain a comprehensive understanding of their interests and capabilities, thereby formulating effective training programs for precise talent cultivation. For instance, with the rapid advancement of AI technology, the market demand for AI-skilled professionals continues to rise. Universities can adjust their curriculum to incorporate more practical AI content, enabling more effective talent delivery and creating favorable conditions for students' future career development [1].

4. The Challenges of Digital Empowerment in the Integrated Development of Higher Education Technology Talents

First, the network infrastructure is inadequate. Currently, the internet has become a vital link connecting education, scientific research, and talent development. However, some universities still underinvest in network infrastructure, such as limited bandwidth, which often causes lag during live online course broadcasts, disrupting teaching continuity. Additionally, insufficient network coverage

results in signal dead zones in university libraries and laboratories, making it difficult for many faculty and students to access online resources. This not only hinders interactive learning for students but also limits teachers' research progress.

The second challenge lies in the integration and sharing of digital resources. Currently, digital resources remain fragmented both within individual universities and across institutions. Internally, each university manages its digital resources independently, creating 'resource silos' that complicate resource allocation. The fragmentation between universities is further exacerbated by significant differences in resource formats and content standards, making unified planning difficult. For instance, each university designs its own online education platform for courses, with varying quality of uploaded materials. This situation hinders resource sharing and circulation, thereby impeding the digital empowerment of integrated development in higher education technology talent [2].

Thirdly, the digitalized scientific teaching model faces challenges. Some teachers lack proficiency in using digital tools and designing online courses, and struggle to adapt to new teaching tools. For instance, when developing new platform-based instruction, they cannot skillfully implement interactive features like voting and quick-response functions, resulting in low student engagement. Moreover, students find it difficult to adapt. The digitalized teaching model relies heavily on students' self-directed learning abilities. However, some students currently exhibit poor self-directed learning quality, lacking initiative and planning. For example, they casually watch online courses without systematic summarization, leading to subpar learning outcomes.

Fourth, the talent cultivation and evaluation system remains inadequate. Most universities lack market research in talent development objectives and still adhere to traditional curricula, resulting in graduates who fail to meet industry demands. In the AI field, societal expectations require students not only to master core technologies like machine learning and deep learning algorithms but also to demonstrate practical application skills in real-world scenarios. However, current AI education overemphasizes theoretical learning while neglecting practical outcomes and interdisciplinary competencies. This disconnect between academic goals and industry needs leaves graduates ill-prepared for job requirements, diminishing their overall competitiveness and hindering the integration of scientific and technological talent development in higher education.

5. Strategies for the Integrated Development of Digital Empowerment in Higher Education Technology Talent

5.1 Strengthening the Construction of Digital Infrastructure

Enhancing resource allocation and infrastructure modernization. Digital infrastructure directly determines the ultimate level of integrated development in education, technology, and talent cultivation. Therefore, governments and universities should increase funding through fiscal allocations and special funds to improve campus infrastructure. For network facilities, specific measures include optimizing bandwidth and collaborating with telecom operators to introduce 5G and 10-gigabit fiber optics, thereby expanding coverage and improving quality. Additionally, upgrading teaching equipment with multimedia classrooms equipped with high-definition projectors and interactive large-screen recording systems can meet diverse instructional needs. When necessary, virtual laboratories should be established to support experiments in STEM disciplines like physics and chemistry, enabling students to grasp knowledge more intuitively and concretely [3].

The comprehensive upgrade of digitalization drives through advanced technologies. This phase emphasizes integrating cutting-edge solutions like AI and IoT to elevate digital capabilities in education and research. In teaching, AI can be applied to educational system development by providing personalized learning recommendations tailored to students' characteristics. For instance,

the system analyzes students' learning data to identify knowledge gaps and delivers targeted exercises to strengthen foundational skills. This approach reduces teachers' workload while enhancing instructional efficiency. IoT technology facilitates intelligent management through real-time monitoring of operational status via sensors installed in various devices, enabling remote supervision. When equipment malfunctions occur, the system promptly diagnoses issues and coordinates maintenance with technicians. This model also enables smart adjustments to classroom lighting, air conditioning, and curtains to optimize learning environments. In research, AI assists in data analysis and model development. For example, AI algorithms process massive datasets to uncover underlying insights, supporting researchers' work. Additionally, management software and intelligent tools analyze efficiency across project applications to cost evaluations, improving overall process management effectiveness and boosting teams' research innovation capabilities.

5.2 Promoting the Joint Development and Sharing of Digital Resources

Building a Resource Integration Platform. The Yangtze River Delta region in China once established a "University Alliance," which provides substantial support for resource platform development. Specifically, while the region boasts abundant academic resources, digital resources were previously fragmented. To effectively address this, the alliance has collaborated to create a digital resource sharing platform integrating libraries, online courses, and research repositories from all participating universities. This platform enables centralized management and sharing of resources. During its development, systematic research was conducted to standardize cataloging practices for digital resource categories across institutions, ensuring consistent format compliance. The platform adopts a unified access interface standard, allowing users to query resources from all member universities with a single login, thereby enhancing resource utilization. Through this platform, the Yangtze River Delta has achieved collaborative digital resource sharing, yielding significant educational benefits. For instance, students can access online courses and explore diverse educational philosophies. By centralizing resource management, the platform also reduces infrastructure costs, freeing up funds for in-depth resource development and application. This initiative effectively promotes the integrated development of universities and educational technology professionals.

Establishing a resource-sharing benefit distribution mechanism. This involves creating a paid resource usage system. High-quality digital resource users should pay a fee to the provider to ensure their interests, with payment methods including per-use or annual subscriptions. Simultaneously, a reward system for collaborative resource sharing should be designed, offering material incentives like excellence awards and funding support to researchers and university faculty who actively participate in resource sharing to motivate their initiative. To ensure orderly resource sharing, policy and legal frameworks must be improved. The government should clarify copyright ownership and usage rights to provide legal references for future resource sharing. Specific measures could include implementing the "Digital Resource Sharing Management Measures" to define operational procedures, protect stakeholders' rights, prevent data misuse, and create safer conditions for resource sharing [4].

5.3 Innovating Digital Teaching and Research Models

To effectively enhance teachers' digital literacy, a systematic training program should be established. Specifically, three training tiers-basic, intermediate, and advanced-should be designed based on teachers' needs and proficiency levels. The basic training addresses challenges faced by veteran teachers in learning digital tools through theoretical explanations and practical skill development. With a duration of 3-4 hours, it focuses on hands-on multimedia software operation,

followed by practical sessions to solidify mastery. Intermediate training emphasizes digital instructional design, focusing on creating online courses tailored to student characteristics and interactive learning using digital tools. Experts and teachers will exchange experiences, sharing the latest concepts and methodologies. Case studies are typically conducted three times weekly. Upon completion, teachers must submit a detailed teaching design plan for evaluation. Advanced training involves specialized lectures on AI, VR, and blockchain technologies for core teachers, helping them understand cutting-edge technological trends. For example, three experts may be invited monthly to conduct seminars and academic discussions, encouraging teachers to pilot innovative reforms. After training, teachers are required to write research reports on applying frontier technologies in education and share their findings with peers.

The curriculum will incorporate courses and hands-on experiments to develop students' self-directed learning and collaborative skills. For instance, the "Digital Learning Methods and Strategies" course focuses on digital learning characteristics and techniques, providing systematic guidance on personalized learning approaches and customized plans to help students master digital tools. Additionally, diverse practical activities like the "Online Course Design Competition" and "Digital Learning Achievement Contest" are designed to boost student initiative. Through these competitions, students not only enhance their digital learning capabilities and innovative thinking but also gain hands-on experience in solving technical challenges. In one research project, Student A applied big data analytics and AI for data analysis and model development to elevate research quality. These courses and practical activities have significantly improved the student's digital learning proficiency, further strengthening their self-directed learning effectiveness.

5.4 Improving the Digital Talent Training and Evaluation System

In talent cultivation, aligning with market demands is crucial. Universities should collaborate with enterprises while conducting market research to comprehensively understand societal needs regarding professionals' skills, knowledge structures, and competencies. Based on these findings, institutions should adjust training objectives and curriculum systems-such as emphasizing practicality and increasing practical course proportions-to ensure students achieve comprehensive development in their academic fields. Regarding evaluation systems, diversified indicator selection is essential. For instance, integrating practical competency metrics like project completion rates and hands-on skill assessments into existing evaluation frameworks helps gauge students' overall performance in practical components. Taking computer science students as an example, analyzing their performance in software development projects-including design, coding, and testing phases-can reveal their teamwork and problem-solving abilities. To ensure effective evaluation, combining formative and summative assessments through methods like self-evaluation and peer reviews allows comprehensive evaluation of students' capabilities, providing precise feedback for cultivating digital talent [5].

6. Conclusion

In summary, most universities have now adopted digital technologies to foster integrated development of educational technology professionals, with the government providing policy support to facilitate implementation. However, challenges persist in this process, including inadequate infrastructure and difficulties in resource integration. To address these issues, comprehensive upgrades to infrastructure are essential to promote collaborative digital resource sharing. Additionally, establishing robust digital teaching and research models will further enhance the cultivation and evaluation systems for digital talent. This approach will make the integration of educational technology professionals more practically meaningful, ultimately serving as a key

driver for societal progress.

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