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Practical Training System for Triple-Type Talents in Economics and Management Programs under the TPACK-SAMR Framework

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Abstract: In the context of digital-intelligence integration, economics and management programs in application-oriented universities face practical difficulties. These include lagging curriculum updates, inadequate training facilities and insufficient integration between industry and education. There is an urgent need for a new cultivation path for Triple-Type talents aligned with digital economy development. This paper reviews international practices regarding Triple-Type talent cultivation in areas such as intelligence, personalization and interdisciplinary practice. It also reflects theoretically on domestic reforms in curriculum reconstruction, training platform upgrades, innovation systems and school-enterprise cooperation. Current research lacks systematic theoretical support for the deep integration of technology and pedagogy. Therefore, this paper utilizes the TPACK model to restructure teacher knowledge and the SAMR model to enhance technology application levels. A spiral cultivation route covering basic, professional and innovation skills is designed. A Loop-Chain-Network triple digital-intelligence training environment is established. The loop environment focuses on specialized skill reinforcement. The chain environment enables system capacity expansion. The network environment deepens innovation capability cultivation. These components provide a reference for the digital transformation of higher education.

Keywords: TPACK-SAMR Framework; Application-Oriented Universities; Economics and Management Programs; Triple-Type Talents; Practical Training System.

1. Introduction

The 2024 National Science and Technology Conference further noted the importance of technology innovation demands in optimizing academic disciplines and innovating talent cultivation models. These directives provide a direction for talent cultivation in application-oriented universities. With the rapid development of the digital economy, emerging technologies like artificial intelligence, big data and blockchain are transforming the operations of economics and management fields. A 2024 survey by the China Artificial Intelligence Education Alliance found that application-oriented universities have much lower rates of emerging technology courses than Double First-Class institutions due to faculty and equipment constraints. Traditional curriculum systems lag behind technological iterations. The contradiction between talent cultivation and industry demand is increasingly prominent. Research from the McKinsey Global Institute shows that digital technology achieves breakthroughs every 18 months while traditional curriculum updates take 3-5 years. This time gap leaves graduates with obsolete skills. Data from the LinkedIn 2024 China Talent Market Insight Report shows that 85% of employers for economics and management roles require data analysis skills. Additionally, 73% require familiarity with AI tools and 68% emphasize interdisciplinary integration capabilities.

2. Triple Dilemmas of Talent Cultivation in Economics and Management Programs

Economics and management programs in application-oriented universities currently face three major challenges. First, the digital transformation necessitates a revolution in talent cultivation models. The 2024 Industry-Education Integration Efficiency Evaluation Report by the Ministry of Education indicates that fewer than 30% of application-oriented universities engage in substantive cooperation like joint textbook development or laboratory construction. The industry requires interdisciplinary talents who master professional theories and excel in data analysis and AI applications. These individuals must possess digital mindsets and innovative capabilities. Recruitment standards have shifted from professional knowledge to a comprehensive assessment of technology application, innovative thinking and interdisciplinary literacy. Second, there is a structural mismatch between talent cultivation and industry needs. A sample survey by the Higher Education Evaluation Center shows that only 17.8% of economics and management laboratories in application-oriented universities possess AI application environments. Platforms supporting big data analysis cover less than 25%. Training environments for blockchain technology are even rarer at only 8.6%. This lag in facilities restricts the development of digital-intelligence capabilities. It fails to meet the urgent needs of industry upgrades. The 2024 China Talent Development Report predicts a gap of 3 million interdisciplinary talents in the next five years. Existing university systems struggle to address this challenge effectively. Third, there is a strategic need to serve high-quality regional economic development. According to the 2024 White Paper on Digital Economy Development, Guangxi's digital economy growth rate has ranked among the highest in western China for two years. Emerging sectors like smart manufacturing, digital finance and AI services are growing rapidly. As a gateway for the Belt and Road Initiative and a hub for the China-ASEAN Free Trade Area, Guangxi is

building a digital economy highland. The demand for innovative and application-oriented talents with digital mindsets and interdisciplinary skills is rising. This study shows that over 80% of small and medium-sized enterprises in Guangxi face digital transformation challenges. They urgently need interdisciplinary talents with AI application abilities and professional expertise.

Consequently, application-oriented universities must align with regional strategies and industry demands. Integrating campus and external resources to build a cultivation system for interdisciplinary talents is essential. Reforming practical training models is a necessary and urgent task to respond to industrial changes and improve education quality.

3. Research and Practice of Triple-Type Talent Cultivation Abroad

Entrepreneurial motivation, entrepreneurial opportunities and innovation skills constitute the core elements of entrepreneurship. These elements are systematically improvable through education [1]. Developed countries cultivate Triple-Type talents through innovation and entrepreneurship education. With the widespread application of artificial intelligence, big data and digital platforms, foreign cultivation models now exhibit more intelligent, personalized and interdisciplinary characteristics. Innovation and entrepreneurship education practices in the United States. As a pioneer in this field, the United States has established a complete system from basic to higher education. It leads in integrating digital-intelligence technology. Babson College, Baylor University and the University of Southern California introduced undergraduate entrepreneurship courses as early as the 1980s. The first collegiate business plan competition at the University of Texas at Austin in 1983 marked the beginning of practice-oriented education. Recently, American universities have utilized digital tools to optimize entrepreneurship education. The Enhanced Awareness model at Babson College uses online simulation platforms and data-driven case studies to improve student ability to identify opportunities in dynamic markets. The curriculum emphasizes creativity and incorporates Virtual Reality (VR) and Artificial Intelligence (AI) to simulate authentic entrepreneurial scenarios [2]. The systems thinking model at Stanford University emphasizes digital-intelligence integration. It supports entrepreneurial decision-making through big data analysis and interdisciplinary projects based on student backgrounds to build systematic management capabilities. This model relies on an open educational ecology and collaborates with technology companies. It uses AI tools to evaluate the feasibility of business opportunities and forms a networked, interactive training system [3]. Furthermore, American universities explored the application of generative AI in entrepreneurship education in 2023. Intelligent tutoring systems provide personalized guidance and improve the efficiency of innovative talent cultivation [4].

The practical orientation model in Germany. German innovation and entrepreneurship education features practicality and cross-sector cooperation. This model strengthens Triple-Type talent cultivation through digital-intelligence integration. The German education system designs tiered cultivation paths based on student interests and professional needs. These plans exist from vocational schools to comprehensive universities. Recently, German universities introduced courses related to smart manufacturing and Industry 4.0 with government support. Students develop innovation and practical skills through digital platforms like SAP systems and virtual laboratories [5]. The advantages of this model include cross-sector synergy where universities partner with enterprises and social organizations for project-based learning. Big data analysis optimizes training designs. Practical orientation is another advantage where skill competitions and entrepreneurial designs enhance hands-on abilities. For instance, the Technical University of Munich collaborates with Siemens to help students develop smart supply chain solutions using AI-driven simulation tools. This creates a strong digital-intelligence atmosphere [6]. In 2024, German universities further integrated Digital Twin technology into training systems. Interactive simulations between virtual and real environments improve student application skills and show significant results in cultivating interdisciplinary talents for smart manufacturing [7].

The industry-university synergy path in Japan. Japanese innovation and entrepreneurship education focuses on application-oriented and high-tech talents. It deepens industry-university cooperation within the digital-intelligence context. Japanese universities meet Triple-Type talent needs through diverse models. The entrepreneur education model uses digital tools such as blockchain technology to support the transformation of innovative ideas into actual products. The comprehensive management skills exercise model uses AI simulation systems to train management and planning abilities. The auxiliary model provides entrepreneurship courses for engineering and medical students and integrates data analysis tools to enhance practical skills. The entrepreneur cultivation learning model stimulates entrepreneurial passion through online learning platforms [8]. Industry-university cooperation is particularly prominent in Japan. For example, the University of Tokyo and Toyota developed a smart transportation project. Students cultivate interdisciplinary skills through real-time data analysis and simulation training. This model enriches educational forms and enhances cross-domain adaptability through digital-intelligence technology [9]. In 2023, Japanese universities began using Metaverse technology to build virtual entrepreneurial environments. Students engage in transnational team collaboration and innovation practices to improve their international vision and interdisciplinary capabilities [10].

4. TPACK and SAMR Theoretical Models

The TPACK (Technological Pedagogical Content Knowledge) model, proposed by Mishra and Koehler in 2006, extends Shulman's PCK (Pedagogical Content Knowledge) theory. This model suggests that teachers must integrate three core types of knowledge: Content Knowledge (CK), Pedagogical Knowledge (PK) and Technological Knowledge (TK). It emphasizes the intersection and integration of these areas to form new knowledge domains. These include Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK) and the fully integrated Technological Pedagogical Content Knowledge (TPACK). In the reform of practical training systems for economics and management programs, the TPACK model provides a systematic thinking framework. Content Knowledge (CK) refers to the core theories, methods and professional skill systems of these

disciplines. Pedagogical Knowledge (PK) refers to training design, organization of learning activities and evaluation methods. Technological Knowledge (TK) refers to the cognition and application of digital-intelligence technologies like big data, artificial intelligence and blockchain. This project applies the TPACK model in several ways. First, it promotes the improvement of digital-intelligence application abilities among faculty to master Technological Knowledge (TK). Second, it guides teachers to use digital technology to enhance the presentation and understanding of professional knowledge to form Technological Content Knowledge (TCK). Third, it encourages teachers to explore how technology transforms training methods to form Technological Pedagogical Knowledge (TPK). Finally, it achieves the integrated innovation of technology, content and pedagogy to form TPACK.

The SAMR model, developed by Ruben Puentedura, describes four levels of technology integration in teaching: Substitution, Augmentation, Modification and Redefinition. Substitution and Augmentation belong to the Enhancement stage. Modification and Redefinition belong to the Transformation stage. In the reform of practical training systems, the SAMR model provides a clear path for innovation. At the Substitution level, digital technology directly replaces traditional tools without functional changes, such as using Excel instead of paper ledgers. At the Augmentation level, technology provides functional improvements like using data visualization to enhance analytical effects. At the Modification level, technology significantly alters the design of learning tasks, such as using cloud computing platforms for collaborative decision-making analysis. At the Redefinition level, technology creates new learning experiences previously impossible, such as using VR or AR technology to build virtual business environments. This project uses the SAMR model as a guiding framework to design a sequence of training activities from substitution to redefinition. This ensures the progressive and deep empowerment of training pedagogy through digital-intelligence technology.

The two theoretical models complement each other. TPACK focuses on building the knowledge system of teachers. SAMR focuses on elevating the level of technology application. Together, they provide theoretical support and practical guidance for constructing a practical training system for economics and management programs in the digital-intelligence context.

5. Reform Ideas for Practical Training System under TPACK-SAMR Framework

5.1. Positioning of Talent Cultivation Goals: Triple-Type Talents Serving Regional Development

Application-oriented undergraduate colleges primarily serve regional economic and social development. Cultivating application-oriented talents remains their core mission. In the context of digital-intelligence integration, new technologies and business formats constantly emerge in economics and management. These developments impose higher requirements on professionals. The widespread use of big data and cloud computing highlights the need for information collection and processing capabilities. The decentralized nature of inclusive finance strengthens the importance of marketing and communication. Meanwhile, the reality of product innovation lagging behind regulation increases the demand for risk assessment and management [11]. Students require innovation awareness and practical skills. They must also master interdisciplinary knowledge by merging economics, management and information technology. This prepares them to be interdisciplinary talents who understand professional theories and proficiently use digital tools. Therefore, this research centers on cultivating innovative, application-oriented and interdisciplinary talents to drive practical training reform. Based on the TPACK model, this study systematically organizes the Content Knowledge (CK) required for Triple-Type talents. This includes core theories and professional skill systems. It combines Technological Knowledge (TK) involving the cognition and application of big data, AI and blockchain. It integrates effective Pedagogical Knowledge (PK) regarding training design and evaluation methods. This builds a three-dimensional integrated goal system. The TPACK model clarifies the integration mechanism of technology, content and pedagogy. Simultaneously, according to the four levels of the SAMR model, the study designs a progressive path. This path moves from basic skill mastery (Substitution and Augmentation levels) to professional skill enhancement (Modification level) and finally to innovation and entrepreneurship cultivation (Redefinition level). This ensures a spiral progression of technology empowerment.

5.2. Spiral Progressive Cultivation Path for Three Core Skills

To achieve the cultivation goals, this research designs a spiral progressive path for three core skills based on SAMR technology application levels and domestic research.

5.2.1. Basic Skill Cultivation: Technology Application at Substitution and Augmentation Levels

Basic skill cultivation corresponds to the Substitution and Augmentation levels of the SAMR model. This includes the following. Data Collection and Analysis, extracting market trends and industry information from multi-source data. Students use tools like Excel and SPSS to replace manual methods and utilize Tableau for visualization to enhance analytical effects. Information Technology Application, using office software and digital platforms for data processing while mastering programming basics like Python and R. Language Expression and Communication, writing clear reports and engaging in effective communication across multiple scenarios. Cultivation at this level establishes a solid foundation for subsequent learning. Technology improves efficiency and quality by replacing and enhancing traditional learning methods. Recently, Xie (2024) proposed integrating data science and AI under the background of New Quality Productive Forces [12]. This includes embedding modules like big data analysis and blockchain finance to enhance interdisciplinary thinking.

5.2.2. Professional Skill Cultivation: Task Reconstruction at the Modification Level

Professional skill cultivation corresponds to the Modification level of the SAMR model. Key areas include the following. Economic Analysis and Decision-making: analyzing market dynamics based on economic principles and using business intelligence tools to transform the decision-making process. Operation Management: optimizing

corporate processes and coordinating resources through ERP systems and supply chain platforms to redesign business workflows. Risk Identification and Control: identifying economic risks and formulating strategies using risk assessment models and early warning systems to change risk management methods. Training at this level ensures students reach high professional standards. Technology application significantly alters the nature and methods of learning tasks. Regarding platform upgrades, Sun (2023) emphasized building AI-driven financial simulation systems [13]. These systems allow students to practice decision-making in complex simulated market environments.

5.2.3. Innovation and Entrepreneurship Skill Cultivation: Experience Innovation at the Redefinition Level

This level corresponds to the Redefinition level of the SAMR model. It involves the following. Product Development and Promotion, designing products based on market demand and using AI-assisted design tools and smart marketing platforms to create entirely new development experiences. Team Coordination and Management: organizing and leading teams through VR technology to simulate management scenarios and using cloud collaboration platforms for cross-temporal cooperation. Innovation Project Planning: identifying opportunities and formulating business plans using generative AI for business model analysis and strategic planning. This level stimulates creative thinking and practical execution. Technology creates new learning experiences impossible through traditional means. Domestic scholars proposed frameworks for innovation and entrepreneurship that provide new ideas for this system [14]. This research builds on those ideas to achieve a higher level of education through deep digital-intelligence application.

The three categories of skills represent a spiral relationship. Students master professional skills based on foundational skills and achieve a qualitative leap in comprehensive ability through innovation training. This ensures continuity in ability cultivation and realizes the transition from technology enhancement to technology transformation.

5.3. Digital-Intelligence Driven Construction of the Loop-Chain-Network Triple Training Environment

This research constructs a digital-intelligence driven Loop-Chain-Network triple training environment based on multiple scenarios including course (cluster) business segments, professional direction chains and cross-domain project networks. It establishes an analytical framework across three dimensions: cultivation goals, training environments and skill development. These three environments correspond to different technology application levels of the SAMR model and different depths of knowledge integration in the TPACK model. It also integrates domestic reform experiences in curriculum systems, training platforms and school-enterprise cooperation.

5.3.1. Loop Environment: Substitution and Augmentation of Specialized Skills and Course Optimization

The Loop environment focuses on specific courses or business segments. It strengthens specialized skills through course modules and corresponds to basic skill cultivation at the Substitution and Augmentation levels of SAMR. Unlike traditional training, this environment introduces intelligent learning analysis technology to track skill mastery in real time and provide personalized learning paths. Training data is visualized to help teachers identify student weaknesses. For example, in the Big Data Analysis and Decision-making Practice course, students use Python and Tableau. The system automatically records operation trajectories and creates personalized capability portraits. This reflects the preliminary fusion of Technological Knowledge (TK) and Content Knowledge (CK) in the TPACK model to form Technological Content Knowledge (TCK). This integration enhances the presentation of professional knowledge. Regarding digital upgrades, it emphasized integrating digital learning abilities and innovation literacy. This research adopts these concepts to achieve precise and personalized training through AI-driven analysis.

5.3.2. Chain Environment: Task Modification for System Capabilities and Professional Chain Integration

The Chain environment centers on professional directions to form complete business chains. It expands skill breadth through course clusters and comprehensive training modules, corresponding to professional skill cultivation at the Modification level of SAMR. The innovation lies in using blockchain and knowledge graph technologies to connect scattered knowledge points into a systematic network. This allows students to see the connections and application scenarios between different courses. For example, by building an intelligent finance business chain involving data analysis, financial decision-making, risk management and business planning, students experience full workflows in virtual simulations. This reflects the deep integration of Technological Knowledge (TK), Content Knowledge (CK) and Pedagogical Knowledge (PK) to form Technological Pedagogical Content Knowledge (TPACK). Technology significantly alters task design, helping students understand the systemic nature of knowledge. This design draws on the ideas of Xie Danlin (2024) to enhance interdisciplinary thinking by embedding big data and blockchain modules.

5.3.3. Network Environment: Experience Redefinition for Innovation and Deep School-Enterprise Synergy

The Network environment utilizes internet technology combined with cross-professional and school-enterprise projects. It deepens the comprehensive and practical nature of student skills, corresponding to innovation and entrepreneurship cultivation at the Redefinition level of SAMR. The innovation lies in constructing a hybrid ecology that combines campus virtual environments with real-world external projects. It introduces actual corporate data and problems while using cloud platforms for collaborative innovation among students, teachers and experts. For example, a digital-intelligence driven collaborative platform allows students from different majors to form virtual startup teams. They use generative AI for business model design while corporate mentors provide real-time guidance. This achieves the Redefinition level by creating new learning experiences and fully merging all TPACK elements. Domestic scholars such as Wu et al. (2024) and Tan et al. (2023) have explored expanding cooperation into fintech and digital training projects [15-16]. This research integrates these experiences to break spatial and temporal limits, moving from resource sharing to deep synergy.

The Loop-Chain-Network triple environment enables cross-over effects and spiral progress, creating a positive

interaction that breaks the limitations of traditional training models. Compared to traditional practical training, traditional training mostly uses independent modules while this triple environment enables continuous cultivation. This approach is expected to increase the correlation of training performance across different professional courses by more than 30%. Traditional training relies on passive reception whereas the triple environment emphasizes a spiral progression of skills. This shift is projected to increase student active learning behavior by 45%. Traditional evaluation methods are singular. This study builds a multidimensional evaluation system combining process-oriented and summative assessments based on data analysis. This allows for precise student capability profiling and is expected to increase evaluation data utilization by 60%. By constructing the dual-model theoretical framework of TPACK-SAMR and integrating domestic research results on Triple-Type talent cultivation, this study systematically addresses current research deficiencies. First, the TPACK model clarifies the deep fusion mechanism of technological, content and pedagogical knowledge. This provides theoretical guidance for restructuring the knowledge framework of teachers and solves the problem in existing research that focuses on horizontal expansion of course content without a vertical deepening theoretical framework. Second, the SAMR model defines a progressive path for technology application. This prevents technology use from remaining at a superficial level of substitution or augmentation. It addresses the limitation where existing training platform upgrades often stay at the tool level without explaining how technology fundamentally changes the learning experience. Third, the construction of the Loop-Chain-Network environment integrates scattered practical explorations such as curriculum reform, training upgrades and school-enterprise cooperation into a systematic training ecosystem. This resolves the issue where existing training systems remain modular and fail to respond accurately to personalized student needs. The combination of these two models and the creative integration of domestic research results builds a complete logical chain from cultivation goals to training environments and capability development. It provides systematic theoretical support and practical guidelines for the reform of practical training systems in economics and management programs within the digital-intelligence integration context.

6. Conclusion

The era of digital-intelligence integration presents new challenges and higher requirements for talent cultivation in application-oriented universities. By introducing the TPACK and SAMR theoretical models, this research provides a systematic solution to the problem of integrating technology and pedagogy. Reforming the training system for economics and management programs is a systematic project. It requires the coordinated promotion of theoretical innovation, model exploration, technology empowerment and institutional support. This research provides a theoretical reference and practical inspiration to help universities cultivate high-quality Triple-Type talents. These talents will meet the demands of the digital economy and support regional economic development and national innovation strategies.

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