



Development of Education - Training and Science - Technology in Vietnam: The Case of Ho Chi Minh City

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ABSTRACT

As Vietnam's leading economic, cultural, and innovation center, Ho Chi Minh City plays a particularly important role in promoting knowledge- and technology-based development. This paper aims to analyze the current state of the relationship between education - training and science - technology in Ho Chi Minh City, and then propose solutions to strengthen the linkage between these two fields for sustainable development. The research methodology employed is an interdisciplinary approach based on the methodology of dialectical and historical materialism, combining methods such as analysis-synthesis, historical-logical, comparative, and processing of secondary data from relevant reports and research works. The research results show that Ho Chi Minh City has achieved many significant accomplishments in expanding its education system, promoting digital transformation, developing an innovation ecosystem, and enhancing scientific research capacity. However, the relationship between education and training and science technology has not yet truly become the central driving force of development. Prominent limitations include: uneven training quality; training content not aligned with market needs; a shortage of high-quality human resources in cutting-edge technology fields; limited practical application in research activities; and ineffective linkages between schools, businesses, and the government. In conclusion, this article proposes several solutions, such as reforming training programs towards practical application, promoting cooperation between educational institutions and businesses, developing high-quality human resources, and improving policy mechanisms to support innovation. These solutions contribute to strengthening the foundation of knowledge-based development, enhancing competitiveness, and moving towards sustainable development of the city in the context of international integration.

INTRODUCTION

Ho Chi Minh City is the largest economic, cultural, scientific, technological, and innovation center in the country, playing a leading role in the process of development and international integration. As a crucial growth pole, the city not only contributes a large proportion to the national GDP but also serves as a hub for high-quality knowledge, technology, and human resources. In the context of strong globalization and digital transformation, development based on knowledge, science, technology, and innovation is increasingly becoming an inevitable trend, creating an urgent need to restructure growth drivers towards greater sustainability and efficiency.

In this process, education - training, and science - technology are identified as two fundamental pillars, organically interconnected and mutually influential. Education and training play a crucial role in providing human resources, fostering creativity, and forming a knowledge base, while science and technology directly drive innovation, enhance labor productivity, and improve competitiveness. The close connection between these two fields not only contributes to improving the quality of growth but also creates conditions for the formation of an innovation ecosystem, meeting the development requirements of a knowledge-based economy in the context of the Fourth Industrial Revolution.

In recent years, under the leadership of the Party and the State, Ho Chi Minh City has achieved many important results in the development of education - training and science -technology. The education system has expanded in both scale and quality; scientific research and technology transfer activities have been gradually promoted; and the application of information technology and digital transformation in education has seen many positive changes. Simultaneously, the city has also formed and developed an innovative startup ecosystem with the participation of universities, research institutes, and businesses, contributing to promoting economic growth and structural transformation towards modernization (Ho Chi Minh City People's Committee, 2024).

However, despite these achievements, the relationship between education - training and science -technology in Ho Chi Minh City still faces many limitations. Training quality is uneven; the content and methods of training are not closely linked to the practical needs of the labor market and businesses; there is a shortage of high-quality human resources in cutting-edge technology fields; scientific research activities are still theoretical and lack practical application; and, especially, the linkage between schools, businesses, and the government is not truly effective. These limitations reduce the ability to transform knowledge into a driving force for development and fail to fully utilize the potential of science and technology in the economy.

In this context, systematically studying the current state of education - training and science and technology development, and analyzing the relationship between these two fields in Ho Chi Minh City, has profound theoretical and practical significance. Based on this, proposing solutions to strengthen the linkage between education - training, and science -technology will not only contribute to improving the quality of human resources but also

promote innovation, enhance competitiveness, and lead to rapid and sustainable development of the city in the current period.

LITERATURE REVIEW

In Vietnam, in general, and Ho Chi Minh City in particular, the issue of developing education-training and science-technology has increasingly been recognized in a comprehensive manner. This subject has attracted early research interest from various scientists and socio-political organizations from diverse perspectives and trends.

The work *Outline of Vietnam's Science - Technology Development Strategy to 2010* (Mai & Binh, 2003) is one of the early systematic efforts to address Vietnam's science - technology strategy in the early 21st century. Based on an analysis of science - technology as key drivers for industrialization and modernization, the book provides strategic orientations to define research-application priorities for socio-economic development and to build national capacity in human resources, infrastructure, and management mechanisms. This work played a vital role in laying the strategic foundation for science - technology in Vietnam during the early stages of renovation and integration.

The study *Promoting Science and Technology, Reforming Education and Training for Sustainable Development* (Central Institute for Economic Management, 2009) analyzes the current state of these fields and proposes major orientations. These include: promoting fundamental and comprehensive educational reform to improve human resource quality; developing science - technology aligned with practical production and daily life; and establishing synchronized mechanisms to integrate science - technology with education - training within a sustainable development strategy. This work provides an important practical basis for research on the roles of these sectors in Vietnam's sustainable growth.

In *Experiences of Some Countries in Developing Science and Technology Education-Training Linked with Intellectual Building* (Vu, 2010), the author reviews the experiences of nations such as Germany, South Korea, the United States, Japan, Singapore, China, and Vietnam. The content clarifies how these countries develop science and technology education alongside the formation of an intellectual workforce, covering strategic policies, organizational mechanisms, and methods for mobilizing high-quality human resources. Through comparison, the work highlights a commonality: regarding science - technology education as the foundation for enhancing intellectual potential and national competitiveness. However, while providing valuable references, the work remains descriptive of international experiences and has not yet deeply analyzed specific coordination mechanisms in the new context.

The book *The Fourth Industrial Revolution: A Revolution of Convergence and Economy* (Phan, 2022) emphasizes that rapid scientific and technological advancements are leading humanity into a new era, forcing nations to innovate and adapt. As an experienced policymaker, Phan Xuan Dung clarifies the core elements of Industry 4.0 in alignment with the perspectives of the Party and State of Vietnam. This work provides both theoretical and practical foundations for

planning strategies in science-technology, education, and human resources in the context of global integration.

The work *Education: Integration and Development* (Duong et al., 2024) compiles in-depth studies on the opportunities and challenges of Vietnamese education. Key research directions include education in the context of globalization, STEAM applications, school psychological counseling, and higher education linked to sustainable development. This provides a scientific basis for policy planning in the current process of deep international integration.

Regarding research specifically focused on Ho Chi Minh City, the *Proceedings of the Scientific Conference: Ho Chi Minh City - 50 Years of Construction, Protection, and Development (1975–2025)* (Ho Chi Minh City Party Committee, 2025a) is a significant document. Notably, in the second part, the authors evaluate education-training and science-technology, proposing solutions tailored to the city's specific characteristics as it moves toward becoming a future megacity.

In summary, while existing works have initially addressed directions and solutions for developing education-training and science-technology in Vietnam and various localities, they have not yet conducted a direct, focused, and comprehensive study on the integrated development of these two fields specifically for Ho Chi Minh City. Nevertheless, these works serve as invaluable resources for this researcher to inherit and develop in a more specialized and systematic manner.

METHODOLOGY

The study is grounded in the theoretical foundations of dialectical and historical materialism, while also drawing on Ho Chi Minh Thought and the policy orientations of the Communist Party of Vietnam concerning the development of education and science-technology in the context of modernization and international integration. This combination provides a framework that allows the issue to be examined in a more systematic and interconnected way, rather than as a set of isolated factors, helping to clarify how knowledge, innovation, and development processes interact with one another.

In terms of methodology, the article adopts a mixed approach to enhance both the credibility and the explanatory power of the analysis. Historical and logical methods are used to trace how education and science-technology have evolved within specific socio-economic conditions. At the same time, analysis and synthesis are applied to organize both theoretical arguments and empirical evidence. Comparative perspectives are introduced where appropriate to place Vietnam's experience alongside other models, while inductive and deductive reasoning support the development of broader assessments and conclusions. In addition, the study relies on the review and processing of secondary data drawn from official reports, policy documents, and prior research, which helps to anchor the discussion in an empirical context rather than remaining purely conceptual.

RESULTS AND DISCUSSION

Results and Limitations of Education - Training Development in Ho Chi Minh City

In recent years, Ho Chi Minh City has introduced a range of priority policies aimed at increasing investment and encouraging innovation in education and training. These efforts have helped broaden access to education, especially for students from disadvantaged backgrounds, who now have more opportunities to engage with a modern learning environment. At the same time, the city has been rolling out the “Digital Literacy for All” program, targeting groups such as small traders, manual workers, and the elderly. The goal is fairly straightforward but important: to equip people with basic digital skills so they can better navigate and sustain their livelihoods in an increasingly digital economy. Alongside this, more than 20,000 officials have received professional training, and a number of high-performing students have been selected for specialized training in artificial intelligence (Sai Gon Giai Phong Newspaper, 2025).

Beyond these specific initiatives, the city is also trying to move toward a more flexible and open learning ecosystem. The Department of Education and Training has pushed for the implementation of a series of plans related to information technology and digital transformation for the 2022–2025 period, with a longer-term orientation toward 2030. The emphasis here is not only on expanding access, but also on reshaping how education is delivered and managed in a way that better reflects the demands of a digital society. Notably, the city has developed a digital learning resource system, creating online platforms and teaching aids that allow students to access knowledge anytime, anywhere. To date, over 90% of schools in the city have integrated IT and digital transformation into management and instruction, with over 500,000 students participating in online classes (Ho Chi Minh City Party Committee, 2025a, p. 897).

Currently, universities and institutes in Ho Chi Minh City are focusing on spearhead sectors such as semiconductors, integrated circuits (IC), artificial intelligence, quantum technology, biotechnology-pharmaceuticals, new materials, clean energy, and smart manufacturing. Simultaneously, the city is developing R&D centers and key laboratories while attracting multinational technology corporations. Furthermore, special emphasis is placed on developing high-quality human resources, attracting international experts, and strengthening domestic and international training linkages. In the semiconductor industry specifically, the city focuses on IC design (fabless) and high-quality manpower training currently the city's greatest strength.

Education - training serve as vital factors in developing science - technology human resources. These development schemes have increasingly empowered science - technology personnel across all socio-economic and cultural sectors, directly leading social development trends. Currently, Ho Chi Minh City possesses over 21,000 science - technology personnel with 135 dynamic research groups involved in international cooperation. The city's startup ecosystem is increasingly vibrant, featuring over 2,000 startups and dozens of innovation hubs, incubators, and venture capital funds (Sai Gon Giai

Phong Newspaper, 2025). This force is the direct productive factor determining labor productivity and economic growth, helping the city maintain its role as the nation's economic locomotive, contributing over 22% of GDP and nearly one-third of the national budget.

In the process of international integration, education in Ho Chi Minh City not only builds a professional workforce but also fosters a "research culture". Large universities have established strong research groups and innovation centers, reflected in the increasing quality of international publications. In 2022, higher education institutions accounted for 90% of the top 10 Vietnamese organizations with the highest international publications, with Vietnam National University - Ho Chi Minh City leading at 2,248 articles.

The city's educational system is increasingly aligned with the transition toward a knowledge-based and digital economy. This connection is most evident in fields like automation, biotechnology, and smart city management. The expansion of STEM and STEAM models from K-12 to higher education has formed a scientific mindset for the younger generation. Moreover, the integration between educational institutions and tech enterprises allows students early access to practical R&D environments. This "Triple Helix" model facilitates knowledge transfer and the formation of university spin-offs and interdisciplinary R&D contracts.

These shifts demonstrate that Ho Chi Minh City's education - training sectors have become proactive forces in the science - technology ecosystem. Science - technology's contribution to Total Factor Productivity (TFP) growth reached 56%, and the city's startup valuation stands at \$5.6 billion. Notably, Ho Chi Minh City is ranked 110th globally in the Global Startup Ecosystem Index, maintaining a Top 5 position in Southeast Asia and Top 30 globally in Blockchain (Sai Gon Giai Phong Newspaper, 2025). These efforts affirm the city's position as the premier hub for startups, incubators, and large-scale innovation events like the I-Star Awards.

Despite these gains, education and training in Ho Chi Minh City still face a number of persistent challenges that are difficult to overlook.

To begin with, the quality of education is uneven across institutions. A number of leading universities, such as Vietnam National University Ho Chi Minh City, the University of Economics Ho Chi Minh City, and Ton Duc Thang University, benefit from relatively strong resources and more favorable conditions for development. However, many other institutions continue to struggle with limited infrastructure, a shortage of highly qualified faculty, and curricula that have not kept pace with changing demands. One of the most visible consequences is the gap between training and practice. Graduates often lack the practical skills required by employers, particularly in key sectors such as information technology, digital engineering, and logistics. Data from the Ho Chi Minh City Center for Forecasting Manpower Needs and Labor Market Information indicate that the city currently has nearly 290,000 active enterprises, with an annual demand for 320,000 to 350,000 workers. Although trained labor accounts for around 87% of this demand, the workforce still shows clear weaknesses in areas such as teamwork, problem-solving, foreign languages, and IT competence. In addition, issues related to professional discipline and work

attitudes ranging from a lack of consistency and responsibility to certain psychological barriers continue to affect labor quality (Trong, 2025).

A second issue concerns the development of science and technology human resources, especially outside the public sector. Existing budgetary regulations limit the use of public funds to support training for non-state employees, even though a large share of young professionals and skilled workers are employed in the private sector. This creates a structural mismatch between where talent is concentrated and where support is directed. At the same time, not all universities place sufficient emphasis on research, which in turn affects the ability of graduates to engage with new technologies and modern production methods. Investment in education and training, measured as a proportion of GRDP, has yet to keep pace with the city's economic growth. As a result, the overall level of science and technology development remains below what current conditions require, and the number of high-impact, in-depth research projects with clear socio-economic contributions is still relatively modest.

Third, although education serves as the foundation for science - technology and innovation, several structural bottlenecks persist: Inappropriate financial autonomy and organizational mechanisms for public educational and science - technology institutions hinder the development of medium - and long-term research programs and the efficient utilization of infrastructure; Social resources and non-budgetary capital mobilization for innovation remain disproportionate to the city's potential, limiting the transformation of knowledge into commercialized technological products; The linkage between education, enterprises, and research institutes remains largely superficial. It has yet to create a seamless value chain from research and technology transfer to commercialization, thereby restricting the direct impact of education on science - technology and innovation development.

Results and Limitations of Science - Technology Development in Ho Chi Minh City

During its development, Ho Chi Minh City has also been a pioneer in applying science-technology to large-scale online teaching, learning, and assessment, synchronized across all levels. Particularly after the Covid-19 pandemic, the city quickly adapted, making online teaching a regular part of its flexible education strategy. From teaching via Zoom and Google Classroom, schools have gradually shifted to internal digital learning platforms, where each lecture, document, and learning video is built and stored as a "digital knowledge bank." Teachers and lecturers receive digital skills training, and students are equipped with information technology capabilities and the skills to use smart devices safely and effectively. Notably, Ho Chi Minh City is also a pioneer in incorporating the International Computer Driving License (ICDL) standard into its curriculum. The implementation of ICDL not only helps students obtain international IT certifications but also integrates technology, creating a solid foundation for the future generation of "digital citizens". Simultaneously, the digitization of libraries, learning materials, smart management, and the application of artificial intelligence (AI) in education are expanding. Many schools in Ho Chi

Minh City have implemented "Digital Libraries," "Virtual Teachers," and "Robot Assistants," transforming learning spaces into multi-dimensional interactive environments that stimulate interest and creativity. By the 2024-2025 school year, over 98% of public educational institutions in Ho Chi Minh City will have achieved high-speed internet connectivity standards, exceeding the national target of 95% as stipulated in Decision 749/QĐ-TTg on the National Digital Transformation Program to 2025 (Ho Chi Minh City Department of Education and Training, 2025).

Simultaneously, the Department of Education - Training also collaborates with other departments and agencies (Department of Science and Technology, Department of Natural Resources and Environment, Department of Information and Communications, etc.), universities (Ho Chi Minh City University of Education, Saigon University, Vietnam National University Ho Chi Minh City, Institute of Data Science and Artificial Intelligence - Saigon University), and technology enterprises to develop digital transformation solutions and models suitable to the development orientation of the sector. Currently, the city has applied information technology not only in administrative management but also widely to every classroom and every teaching and learning activity. The entire sector has implemented a synchronized education database platform that connects educational institutions, supporting the management of student records, academic results, teacher expertise, and school activities. This system enhances transparency, saves time, and effectively serves data-driven leadership, management, and decision-making.

The application of science - technology to education - training in the city has contributed to training high-skilled human resources, oriented towards modernization and international integration, to meet the needs of socio-economic development and provide a quality workforce for the city and localities in the Southern region. The target is for the percentage of employed workers with training to reach 87% by the end of 2025 and 89% by 2030 (Ho Chi Minh City People's Committee, 2023).

To integrate science - technology into education - training, Ho Chi Minh City is implementing programs such as STEM in general education. At Le Hong Phong High School, students learn STEM through real-world simulation projects using programming software. Nguyen Khuyen Secondary and High School is implementing a digital lab model for natural science subjects. These models allow students to interact deeply, increasing their understanding and critical thinking skills. According to data from the Ho Chi Minh City Department of Education -Training (2024), nearly 100% of secondary and high schools have implemented STEM activities with a focus on expanding technological experiences, problem-solving, and integrating urban practices into lessons.

To meet the demands of the Fourth Industrial Revolution, educational institutions have pioneered the inclusion of artificial intelligence content in the curriculum for general education students. The curriculum focuses on foundational mathematical knowledge for AI, skills in building mathematical models for practical problems, high-level programming skills, and creative

abilities in using AI as an intellectual support tool, contributing to freeing up labor and expanding creative possibilities in many professional fields. Implementing this program helps students develop critical thinking, gradually access modern scientific and technological achievements, while also providing career guidance and equipping them with skills for international integration.

Many schools have established STEM laboratories, digital learning centers, or "Maker Space" models, creating opportunities for students to be creative in interdisciplinary projects. Educational content is no longer simply about imparting knowledge but is linked to practical technological experiences, encouraging critical thinking, collaboration, and problem-solving. Simultaneously, within the Ho Chi Minh City school system, student databases, digital learning resource repositories, and learning management platforms have contributed to enabling schools to systematically monitor students' academic progress, health, and extracurricular activities; thereby supporting moral, aesthetic, and health education, as well as professional development. The digitization of student and teacher data also facilitates educational resource planning, actively supporting the goal of holistic education and serving sustainable development objectives.

Innovation in higher education content through research, technology transfer, and business cooperation is linked to the socio-economic development requirements of Ho Chi Minh City. Universities and research centers in the city have proactively implemented significant innovations through pilot training programs, focusing on cutting-edge technology fields to meet the city's digital economy development strategy, such as artificial intelligence, semiconductors, microchips, quantum technology, biotechnology and pharmaceuticals, new materials, clean energy, and smart manufacturing. Simultaneously, the city is developing R&D centers and key laboratories, attracting technology corporations and multinational enterprises.

In addition to curriculum innovation, educational institutions are continuously expanding specialized fields of study in data science, artificial intelligence, cybersecurity, and digital technology to meet the demand for high-quality human resources in the region. Ho Chi Minh City is also strengthening cooperation with international organizations and leading technology companies through exchange programs, joint training, internships, technology transfer, and joint research projects. These activities not only help improve the quality of education but also bridge the gap between classroom knowledge and the practical demands of businesses. Ho Chi Minh City is emerging as one of the fastest-growing innovative startup ecosystems in Southeast Asia. According to the Ho Chi Minh City Socio-Economic Report (2024), the city currently has over 1,400 information technology businesses, nearly 100 innovation centers, and numerous high-tech parks and co-working spaces. This provides a favorable foundation for universities to implement business-linked training models, immersing students in practical environments and experiences during their studies. This ecosystem also facilitates schools in developing applied, internationally integrated training content that closely follows market needs,

enhancing the competitiveness of the city's human resources during the digital transformation period (Ho Chi Minh City People's Committee, 2024).

Science - technology contribute to changing educational methods towards modernization in Ho Chi Minh City. The deployment of online learning systems, virtual classrooms, and learning management software (LMS) such as Viettel Study, VNPT E-learning, along with internal platforms of schools, has opened up opportunities for more flexible and effective access to education. Blended learning and flexible learning models are widely applied, allowing for a combination of in-person and online learning, optimizing learning time and space.

At the university level, many educational institutions such as the Vietnam National University Ho Chi Minh City, the University of Economics Ho Chi Minh City, the University of Technical Education Ho Chi Minh City, and the University of Technology... have pioneered the application of the flipped classroom method. This method uses video lectures and interactive learning materials to encourage students to self-study before participating in discussions or practical sessions in class. As a result, the role of students shifts from "passive reception" to "active acquisition of knowledge," aligning with the competency-based training orientation of current higher education standards. The science - technology ecosystem of Ho Chi Minh City, including the High-Tech Park, innovation centers, and technology startup networks, has accelerated the digitization of teaching resources. Online lecture repositories, question banks, learning simulations, and smart interactive platforms are developing rapidly, enabling teachers to innovate teaching methods towards a learner-centered approach, increasing learner engagement, and enhancing self-learning and lifelong learning. This is especially important in the context of Ho Chi Minh City's goal of building a "learning city," where education is accessible anytime, anywhere; it also opens up opportunities for innovation in educational models, helping training to be more closely linked to production practices and innovation.

Enhancing personalization and continuous assessment. One of the important contributions of science - technology is the ability to personalize learning paths and provide continuous assessment, thanks to the development of artificial intelligence and learning analytics. These technologies enable educational institutions in Ho Chi Minh City to design learning programs tailored to the needs and abilities of each individual, while providing timely feedback to improve the teaching and learning process. Specifically, AI systems have been applied to suggest appropriate learning materials, build personalized learning paths, and track students' learning progress through real-time data. Currently, educational institutions in the city, such as the Vietnam National University Ho Chi Minh City and the Ho Chi Minh City University of Technology, have implemented online testing systems that allow for automatic question shuffling, rapid grading, and detailed feedback immediately after test completion. These improvements not only save time but also enhance assessment accuracy, helping instructors and students adjust teaching and learning methods on time.

Although science - technology contribute to socio-economic development in Ho Chi Minh City, there are still limitations:

The capacity to apply science - technology lacks uniformity and has not developed in a systematic direction. A significant number of education administrators, teachers, and lecturers have not met the requirements for digital skills, leading to confusion and inefficiency in operating technology platforms. Many teachers face difficulties in designing digital learning materials, organizing online learning activities, or conducting technology-based assessments. This shows that science and technology, and digital transformation, are not just about introducing equipment or software into teaching, but require fundamental changes in pedagogical thinking, teaching methods, and school management capacity. The digital divide between educational institutions, especially between the central area and suburban wards and communes, reflects the inequality in access to technology between students and teachers. This is one of the factors that reduces the effectiveness of policies promoting the application of science - technology in education in the city.

The content of education - training has not met the requirements of rapid development in Ho Chi Minh City. Although considered the leading development engine of the country, a place with favorable conditions for innovating the content of education - training in the context of digital transformation, the content of education - training in Ho Chi Minh City still has certain limitations: The content of education -training in Ho Chi Minh City is slow to be updated compared to the rapid development of the digital economy and high technology, creating an increasingly large gap between theory and practice; the training content lacks interdisciplinary focus and does not concentrate on developing 21st-century competencies, reducing the adaptability of learners in the context of the knowledge economy. While the development of a knowledge-based economy requires the intersection of natural sciences, social sciences, technology, and social ethics, many training programs in Ho Chi Minh City still maintain a single-discipline structure, lacking integration between technology, management, society, and ethics. Courses related to digital skills, design thinking, AI ethics, creative economics, or smart urban management have not been developed comprehensively, both in content and teaching methods; the digital learning resource system and shared open data repositories remain fragmented and lack standardization, despite the city being a pioneer in digital transformation in education; the implementation of STEM education and digital transformation in Ho Chi Minh City is uneven, especially between the inner and outer areas, leading to inequality in learning opportunities.

The digital literacy of teachers and lecturers is uneven and does not meet the requirements of profound innovation, directly affecting the quality of implementing modern teaching models. Despite participating in training programs, most teachers in public secondary schools and vocational education systems still face many difficulties in applying technology to teaching activities, such as: designing and operating blended learning and flipped classrooms; proficiently using learning management systems or interactive learning materials creation tools; analyzing learning data to personalize learning paths; or operating simulation, virtual reality, and augmented reality equipment. Ho Chi Minh City has not yet formed a synchronized and interconnected educational

technology ecosystem. The existing educational technology infrastructure is fragmented, disjointed, and lacks standardization. Each school uses its own LMS platform, making it nearly impossible to share learning materials, integrate learning data, and synchronize assessment results. Furthermore, a common digital learning resource repository for the city has yet to be built or effectively operated. In addition, new teaching methods have not truly replaced traditional ones. The introduction of technology into schools has only gone as far as "digitizing" old methods, for example, using PowerPoint instead of the blackboard, PDF files instead of paper lesson plans, or Zoom instead of in-person classrooms. Modern methods such as project-based learning, problem-based learning, and design thinking have only been truly implemented in a few large universities and some key high schools.

Solutions to Promote the Integration of Education-Training and Science-Technology in Ho Chi Minh City

Based on the analyzed limitations and challenges, strengthening the link between education-training and science-technology in Ho Chi Minh City must be implemented synchronously, systematically, and with a long-term strategic vision. Solutions should not be confined to isolated technical or managerial reforms but must approach a comprehensive restructuring of the knowledge ecosystem. In this system, education-training and science-technology are viewed as two organic pillars, dialectically interacting to drive the development of modern productive forces.

First, Innovating Perception and Development Mindset. There must be a fundamental shift in the awareness of the entire political system, the business community, and society regarding the roles of education-training and science-technology. Evidence suggests that a core cause of the current lack of cohesion is the persistent "siloe" thinking between these two fields. Education is often viewed merely as a process of knowledge transmission, while science-technology is limited to specialized research. In the context of the Fourth Industrial Revolution and the knowledge economy, this approach is no longer appropriate. Education must become an environment for generating new knowledge, and science-technology must be integrated into the entire training process. Therefore, the City needs to intensify communication and re-education efforts to position knowledge, creativity, and innovation as the foundation of development. This shift in perception is not only orientational but also a prerequisite for specific policies and solutions to be effective.

Second, Refining Mechanisms, Policies, and Development Institutions. A foundational solution is to perfect the system of mechanisms and policies to foster the integration of education-training and science-technology. From a Marxist-Leninist perspective, mechanisms and policies belong to the superstructure, which plays a role in orienting and regulating the development of the socio-economic infrastructure. Thus, without a suitable institutional system, the synergy between education and science cannot operate effectively. It is essential to build a close-knit linkage between universities, research institutes, and enterprises. This necessitates the establishment of the "Triple Helix" model, where businesses directly participate in training and research, while educational

institutions align their objectives with solving the practical problems of the economy.

In addition, the financial mechanism should be innovated toward diversifying investment resources and encouraging strong private sector participation in education and scientific research. The formation of science-technology and education-training development funds will act as a "financial lever," supporting applied research projects, innovative startups, and technology transfer.

Simultaneously, the legal system must be refined toward transparency, synchronization, and alignment with international practices. In particular, expanding autonomy for higher education institutions, coupled with rigorous quality accreditation mechanisms, will enable universities to exercise creativity and flexibility in both training and research.

Third, Developing High-Quality Human Resources. Human resources are the central element in the synergy between education-training and science-technology. Therefore, developing high-quality human resources must be regarded as the decisive solution.

At the General Education level: Emphasis should be placed on the comprehensive development of students' capacities, particularly scientific thinking, digital skills, and creativity. Vocational orientation and entrepreneurship education must be integrated early to help students align their career paths with the economy's demands.

At the Vocational Education level: Training must be closely linked to labor market needs, especially in high-tech industries, logistics, finance, and premium services. The "Dual Training System," which combines academic learning with on-site corporate practice, should be expanded.

At the Higher Education and Postgraduate levels: A strong transition is needed from traditional knowledge transmission to developing research, creativity, and entrepreneurial capacities. Curricula must be flexibly designed and updated according to new technological trends and business requirements. Simultaneously, the internationalization of education should be promoted through training collaborations, academic exchanges, and international publications.

Fourth, Promoting Digital Transformation and the Popularization of Science and Technology. Digital transformation is an inevitable trend. Therefore, the City must accelerate the application of digital technology across the entire educational system, from management and instruction to research.

Infrastructure investment: Synchronous investment in technology infrastructure is required to ensure all educational institutions can access modern digital tools.

Bridging the Digital Divide: Efforts must be made to narrow the digital gap between regions to ensure equity in educational access.

Capacity building: Enhancing digital competency for teachers and administrators is a prerequisite for technology to become a genuine tool for quality improvement rather than a mere formality.

Open digital ecosystems: Building an open digital learning ecosystem with online platforms, digital libraries, and open data will contribute to the "democratization of knowledge" and foster lifelong learning and innovation.

Fifth, Building an Innovation Ecosystem. A breakthrough solution is to build an innovation ecosystem founded on knowledge and technology. In this ecosystem, universities, research institutes, enterprises, and state management agencies must be tightly connected through digital platforms and flexible cooperation mechanisms.

Universities as the Hub: Higher education institutions must play a central role, serving not only as training centers but also as the birthplace of new knowledge and technology.

Commercialization: Developing incubators, science parks, and "maker spaces" will facilitate the commercialization of research results.

Market Development: It is essential to develop the science - technology market, creating conditions for research products to be transferred and applied in practice. This not only enhances investment efficiency in science but also drives knowledge-based economic growth.

CONCLUSIONS

In the context of knowledge-based economic development and digital transformation, education - training, and science - technology play a crucial role in the rapid and sustainable growth of Ho Chi Minh City. Despite significant achievements, the connection between these two fields remains limited and has not truly become a central driving force for development, as evidenced by the quality of human resources, coordination mechanisms, and the effectiveness of science - technology application. Based on this, the paper proposes a comprehensive system of solutions, including: reforming perceptions, improving institutions, developing high-quality human resources, promoting digital transformation, building an innovation ecosystem, and enhancing the effectiveness of state management. These solutions aim to establish an organic link between education - training, and science and technology, thereby promoting the role of knowledge and creativity as the core driving force of development.

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