What Is New About Innovative Research Universities? — A Case Study of ShanghaiTech University's Practical Exploration (Postprint)

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Abstract

The report of the 20th National Congress of the Communist Party of China proposes that we must adhere to the principle that science and technology are the primary productive forces, talent is the primary resource, and innovation is the primary driver, deeply implement the strategies of invigorating the country through science and education, strengthening the nation with talented personnel, and driving development through innovation, open up new fields and new tracks for development, and continuously shape new drivers and new advantages for development. Under the urgent demands of national development strategies, the establishment and development of "innovative research-oriented universities" centered around the new "trinity" positioning of education, science and technology, and talent has become a new breakthrough point for China's higher education development to achieve breakthroughs in "bottleneck" scientific research and technology, and to support major national strategic needs. ShanghaiTech University was established in 2013. As a pilot unit for comprehensive education reform, over the past decade it has conducted a series of explorations and innovations in promoting interdisciplinary integration and the fusion of science and education, all centered around serving the national innovation-driven development strategy. This article, drawing upon the practical experience of ShanghaiTech University over the past decade, explores how innovative research-oriented universities can promote scientific knowledge innovation, cultivate high-level talent, drive high-quality regional development, and facilitate the transformation of China's higher education.

Full Text

What is the Innovativeness of Innovative Research-Oriented Universities? —A Case Study of ShanghaiTech University

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Abstract

In the report of the 20th National Congress of the Communist Party of China, it is emphasized that upholding the principles that science and technology constitute the primary productive force, talent is the primary resource, and innovation is the primary driving force is of utmost importance. The deep implementation of strategies such as the strategy for invigorating the country through science and education, the strategy for strengthening the nation through talent development, and the strategy for driving development through innovation is emphasized. Furthermore, the need to explore new domains and pathways for development, and continuously shape new dynamics and advantages for progress is underscored. Given the urgent needs of these development strategies, establishing and developing "innovative research-oriented universities" that center on the integration of "education, science and technology, and human resources" has become a new breakthrough point for China's higher education to tackle the "bottlenecks" of scientific research and technology and to support major national strategic needs. Established in 2013, ShanghaiTech University, as an educational reform pilot entity, has made a series of explorations and innovations in promoting interdisciplinary research and integration of science and education in the past ten years, to serve China's national innovation-driven development strategy. This study, based on the practical experience of ShanghaiTech University over the past decade, explores how innovative research-oriented universities can promote scientific knowledge innovation, cultivate high-level talents, promote high-quality regional development, and help transform China's higher education.

Keywords: innovative research-oriented universities, discipline building, scientific research, talent cultivation, national large-scale research infrastructures

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Introduction: The National Strategic Context

The report of the 20th National Congress of the Communist Party of China proposes that we must adhere to the principle that science and technology are the primary productive forces, talent is the primary resource, and innovation is the primary driving force. It calls for deeply implementing the strategies of invigorating the country through science and education, strengthening the nation through talent development, and driving development through innovation, opening up new fields and new tracks for development, and continuously shaping new drivers and new advantages for development. Under the urgent demands of national development strategies, the creation and development of "innovative research-oriented universities" centered on the new positioning of the "trinity" of education, science and technology, and talent has become a new breakthrough point for China's higher education to achieve breakthroughs in "bottleneck" scientific research and technology and to support major national strategic needs. ShanghaiTech University, established in 2013 as a pilot unit for comprehensive educational reform, has conducted a series of explorations and innovations over the past decade in promoting interdisciplinary integration and the fusion of science and education to serve the national innovation-driven development strategy. This article draws on ShanghaiTech University's decade of practical experience to explore how innovative research-oriented universities can promote scientific knowledge innovation, cultivate high-level talents, drive high-quality regional development, and contribute to the transformation of China's higher education.

The Imperative for a New Type of University

Talent cultivation plays a fundamental role in building China into a world leader in science and technology. The issue of talent cultivation has always attracted high attention from policymakers, academia, and society. On September 10, 2018, President Xi Jinping emphasized at the National Education Conference that "we must deepen reforms in the school management system and educational administration to fully stimulate the vitality of educational development." Talent cultivation adapted to China's new development stage must have new target requirements, new development strategies, and new policy decisions. Universities, as important venues for talent cultivation and knowledge production, hold indispensable value for scientific and technological development and social progress. Although traditional research universities play crucial roles in creating human knowledge and promoting social progress, they have faced criticism regarding their ability to create new scientific technologies and cultivate innovative talents due to their large institutional size and complex systems. Additionally, the rapid development of new technologies such as artificial intelligence in recent years has posed new challenges for the transformation and development of higher education. To address these challenges, new types of research universities have continuously emerged globally in recent decades, most of which are science and engineering universities based on high technology, such as the University of

Tsukuba in Japan and the Korea Advanced Institute of Science and Technology.

ShanghaiTech University: A Decade of Exploration

ShanghaiTech University (hereinafter referred to as "ShanghaiTech") was established in 2013 as a full-time regular institution of higher learning jointly established and built by the Shanghai Municipal People's Government and the Chinese Academy of Sciences (CAS), with the Shanghai Municipal People's Government responsible for daily management. Approved by the Ministry of Education in 2013 and selected as a "Double First-Class" university in the second round on February 14, 2022, ShanghaiTech is the only newly added "Double First-Class" university in Shanghai. As a pilot unit for comprehensive educational reform, ShanghaiTech has conducted a series of explorations and innovations over the past decade in integrating science and education, cultivating innovative talents, and deeply participating in the construction of Shanghai's high-level talent hub and Shanghai Science and Technology Innovation Center. As of March 2023, ShanghaiTech has a total of 5,484 students, including 1,761 undergraduates, 2,617 master's students, and 1,106 doctoral students.

Research Excellence and Student Engagement

Since 2016, ShanghaiTech has published 77 papers in top international academic journals such as *Cell*, *Nature*, and *Science* as the first author or corresponding author institution. From 2019 to the present, one research achievement has won the first prize of the Shanghai Natural Science Award, two achievements have been selected for "China's Top Ten Scientific Advances," one achievement has been selected for "China's Top Ten Scientific and Technological Advances in Higher Education Institutions," and five achievements have been selected for "China's Top Ten Advances in Life Sciences." Currently, 63% of ShanghaiTech's courses adopt a research-based teaching model, 82% of undergraduate students enter laboratories before their junior year, and approximately 10% of undergraduate students have already achieved research results during their undergraduate studies. Moreover, a group of faculty and students have embarked on the path of innovation and entrepreneurship. To date, ShanghaiTech has spun off nearly 40 enterprises, with early-stage venture financing exceeding 1.4 billion RMB and patent licensing contracts totaling over 6 billion RMB.

Emphasis on Basic Research and Interdisciplinary Integration

Aiming to serve the national innovation-driven development strategy, ShanghaiTech has focused on frontier areas of basic research since its establishment, achieving multiple major original innovations in major fields such as photon science, artificial intelligence, biomedicine, and energy science over the past decade. Interdisciplinary integration is a hallmark of ShanghaiTech's education, with collaboration with CAS playing a crucial supporting role in promoting basic research and interdisciplinary studies. In basic research, the university engages in mutual expert appointments, joint student cultivation, shared scientific research

resources, co-construction of large-scale scientific facilities, and joint research on major topics with CAS institutes, providing strong support for enhancing academic standards and research capabilities. In interdisciplinary integration, CAS and ShanghaiTech have jointly conducted multiple cross-disciplinary research projects, offering new ideas and approaches for the development and innovation of related disciplines.

This emphasis on basic research and interdisciplinary integration is also reflected in student cultivation at ShanghaiTech. Characterized by broad disciplinary exposure and solid foundational training, ShanghaiTech's student cultivation highlights general education, professional education, and innovation and entrepreneurship education. In terms of institutional structure, ShanghaiTech does not have departments but only schools. For example, the School of Physical Science and Technology includes different majors such as physics, chemistry, and materials science, a structure that better promotes interdisciplinary integration. In curriculum design, student training programs cover basic discipline courses, general education courses, theoretical teaching, and practical teaching, emphasizing the coordinated development of knowledge systems, capability enhancement, and comprehensive quality.

Integration of Science, Education, and Industry

Due to its co-founding by CAS and the Shanghai Municipal People's Government, the integration of science and education has been an advantage and even the "gene" of ShanghaiTech from the beginning. In student cultivation, ShanghaiTech fully leverages this characteristic. Approximately 80% of undergraduate students enter laboratories to participate in research work between their first and third years, with about 10% having achieved research results and published high-level academic papers during their undergraduate studies. Faculty emphasize integrating frontline research experience into courses to cultivate students' scientific literacy. The university widely offers rich academic lectures and reports to stimulate students' research enthusiasm. Adhering to the principle of "cultivating people through research and cultivating people through projects," ShanghaiTech opens all scientific research instruments and equipment to all students and is committed to promoting the aggregation of scientific and educational innovation resources into teaching and talent cultivation, establishing a long-term mechanism where research feeds back into teaching and talent development.

Industry-education integration is also a necessary condition for the development of innovative research universities. ShanghaiTech attaches great importance to the transformation of scientific and technological achievements and has built an innovation and entrepreneurship ecosystem composed of schools and institutions. On the one hand, ShanghaiTech focuses on cultivating high-value patents, targeting invention patents in strategic emerging industries and emphasizing the application and maintenance of invention patents with overseas patent families. These high-quality patents have laid a solid foundation

for the transformation of scientific and technological achievements. Currently, 25% of ShanghaiTech's patents have been commercialized. On the other hand, ShanghaiTech emphasizes that patent achievements should be market-oriented and enter the market. Since its establishment, ShanghaiTech has strategically positioned the School of Entrepreneurship and Management, which focuses on innovation and entrepreneurship as a key discipline, aiming to cultivate technology management talents serving the real economy. Additionally, the university has established a Technology Transfer Office in its functional departments to promote the transformation of scientific and technological achievements and innovation and entrepreneurship among faculty and students throughout the university. This innovation and entrepreneurship ecosystem facilitates the transfer and transformation of high-level scientific and technological achievements. Since 2018, ShanghaiTech has ranked among the top 10 universities nationwide in patent licensing contract amounts for three consecutive years.

Large-Scale Scientific Facilities

The construction of large-scale scientific facilities has a very long cycle and involves multidisciplinary integration, which aligns well with ShanghaiTech's basic research and interdisciplinary approach. Large-scale scientific facilities provide ShanghaiTech with advanced scientific research platforms and facilities that help improve the university's scientific research level. By undertaking the construction of large-scale scientific facilities, ShanghaiTech actively engages in tackling technological challenges in "bottleneck" areas and supporting major national scientific and technological needs.

In October 2020, ShanghaiTech established the Big Science Center. Upholding ShanghaiTech's "small but excellent" philosophy, the Big Science Center focuses on large-scale scientific innovation, particularly the realization of extreme detection capabilities such as free-electron lasers and synchrotron radiation. The center's research directions include methodology and key technology development for photon science large-scale facilities, applications of free-electron lasers and synchrotron radiation in life and energy sciences, non-equilibrium and ultrafast physics/chemistry, light-electron-matter interactions, and big data analysis and processing. The Big Science Center has gradually established independent research groups with complementary capabilities and collaborative directions in these fields, including interdisciplinary research teams in surface chemistry, ultrafast X-ray spectroscopy, X-ray imaging, accelerator physics, atomic and molecular physics, X-ray resonance/non-resonance, and attosecond science, as well as corresponding R&D support platforms such as cutting-edge detector platforms, ultra-high-throughput scientific data development platforms, and precision machining platforms.

According to international practice, after large-scale scientific facilities become operational, they will attract a large number of external and even international users, which will strongly promote international cooperation and exchange at ShanghaiTech. As an important support for Shanghai's industrial development,

the Zhangjiang cluster of large-scale scientific facilities can actively promote industry-university-research cooperation and facilitate the transformation and commercialization of scientific research achievements. Relying on its close relationship with the Zhangjiang cluster of large-scale scientific facilities in Shanghai, ShanghaiTech can cooperate with enterprises and research institutions to accelerate the transformation of scientific research achievements and promote regional scientific and technological innovation and economic development. In terms of student cultivation, the Big Science Center provides students with opportunities to conduct scientific research and experiments on large-scale scientific facilities through activities such as the "Photon Science Summer School," broadening their knowledge and skills and cultivating their innovative spirit and practical abilities to better adapt to future social development needs. In terms of industry-university-research cooperation, ShanghaiTech's Big Science Center provides enterprises and research institutions in Shanghai and even nationwide with opportunities to use large-scale scientific facilities and conduct R&D cooperation, enabling deeper cooperation with industry, providing scientific and technological support and services to industry, and obtaining more opportunities for scientific and technological achievements transformation.

The 2060 Institute: Addressing Carbon Neutrality

In response to the Party and the state's solemn commitment to achieve carbon peak by 2030 and carbon neutrality by 2060, ShanghaiTech began planning the 2060 Institute in October 2020, an institute oriented toward achieving China's carbon neutrality goals. During the planning period, ShanghaiTech fully leveraged its characteristics as a research-oriented and innovative university and its advantages in integrating science and education, jointly with the Shanghai Advanced Research Institute of CAS and the Shanghai Institute of Applied Physics of CAS, integrating resources and innovating mechanisms. The 2060 Institute has established a development strategy focusing on forward-looking research and integrated innovation and development oriented toward carbon neutrality goals, cultivation of new disciplines related to carbon neutrality, cultivation of innovative talents in the carbon neutrality field, and research and consulting on economic and social development strategies under carbon neutrality constraints.

The establishment of the 2060 Institute will fully leverage the disciplinary advantages of relevant schools and the innovative research advantages of integrating science and education at ShanghaiTech to carry out high-level R&D across departments, disciplines, and technologies oriented toward key tasks and objectives of carbon neutrality, propose scientific solutions, and conduct application scenario technology verification and demonstration. The 2060 Institute will focus on breakthrough technological innovations in the energy field, organizing and carrying out advanced nuclear energy system R&D and comprehensive energy system construction on the energy production side, and low-carbon frontier technological innovation on the energy use side. Additionally, the 2060 Institute will actively promote integrated innovation that integrates with indus-

tries and social life, focusing on three key directions: carbon emission-intensive industries, green and low-carbon policies and market systems, and green and low-carbon lifestyles, promoting the interdisciplinary integration of energy, information, manufacturing, management, and other disciplines, and advancing R&D in smart energy, energy efficiency management, and green manufacturing to serve the green, low-carbon, and sustainable development of the economy and society.

In advancing scientific and technological innovation for carbon neutrality, the 2060 Institute will strengthen cooperation with high-level universities, research institutions, and enterprises both domestically and internationally, actively building a discipline construction and compound innovative talent cultivation system in carbon neutrality-related fields. The establishment of the 2060 Institute will bring new ideas and models to ShanghaiTech's education and teaching work. Through exchanges and cooperation with the 2060 Institute, students can gain in-depth understanding of future technology development trends and frontier technologies, cultivate innovative spirit and practical abilities, and enhance their comprehensive quality and competitiveness to prepare fully for future career development.

Shanghai Clinical Research Center: Serving Public Health

In October 2016, the Central Committee of the Communist Party of China and the State Council issued and implemented the "Healthy China 2030" Plan Outline, which clarified the grand blueprint and action plan for promoting the construction of "Healthy China." In March 2017, Shanghai issued the "Healthy Shanghai 2030" Plan Outline, which clearly proposed promoting health science and technology innovation, building medical science and technology innovation platforms, promoting the construction of research-oriented hospitals, advancing collaborative cooperation among basic research, clinical research, and translational application, building clinical trial platforms for innovative drugs and medical devices with internationally advanced levels, and making Shanghai a global health science and technology innovation center and a model global healthy city by 2030.

To better serve national and Shanghai's development strategies, ShanghaiTech is building the Shanghai Clinical Research Center. As a research hospital under the Shanghai Municipal Health Commission, entrusted to ShanghaiTech for construction and management, the Shanghai Clinical Research Center is a new type of innovation pilot unit in Shanghai. The center innovates its medical model with two core functions: "clinical practice and trials" and "basic and translational research," adopting a two-way circular research model of "from laboratory to ward" and "from ward to laboratory," centering on patients and creating exclusive diagnosis and treatment areas and multidisciplinary consultation areas for patients.

The Shanghai Clinical Research Center actively promotes the integration of

medicine, education, and research, gathering high-quality clinical research resources and building breakthrough innovation research platforms. It conducts exchanges and cooperation with relevant schools and institutes such as the School of Life Science and Technology, School of Information Science and Technology, School of Biomedical Engineering, Institute of Immunochemistry, and iHuman Institute at ShanghaiTech, and offers a series of lectures on "Frontiers of Clinical Research" for the entire university to jointly explore innovative breakthroughs in interdisciplinary research fields. At the same time, the Shanghai Clinical Research Center strengthens cooperation with hospitals to promote clinical research and achievement transformation. ShanghaiTech has widely cooperated with municipal hospitals such as Zhongshan Hospital, Huashan Hospital, Children's Hospital of Fudan University, Huadong Hospital, Cancer Hospital of Fudan University, Ruijin Hospital, Ninth People's Hospital, Shanghai General Hospital, Shanghai Sixth People's Hospital, Shanghai Tenth People's Hospital, and Shanghai Pulmonary Hospital affiliated with Shanghai Jiao Tong University School of Medicine, conducting nearly 80 clinical research and achievement transformation cooperation projects in fields such as infectious diseases, respiratory diseases, cancer, neurodegenerative diseases, musculoskeletal diseases, cell therapy, and gene therapy. ShanghaiTech has launched innovative joint master's programs, providing research seed funds for cooperative teams and supporting conditions for cooperative doctors' research work.

The Shanghai Clinical Research Center will also actively participate in, organize, and promote the accelerated development of Shanghai's biomedical industry, creating an innovation source for new drugs, new equipment, new devices, new technologies, and new materials, as well as for clinical guidelines, disease diagnosis and treatment norms, and standards. It is committed to becoming a talent cultivation base for medical scientists with both high-level clinical capabilities and biomedical research capabilities, accelerating the building of a Shanghai-characteristic clinical research community, promoting the open sharing and coordinated utilization of clinical research resources throughout the city, closely connecting the latest scientific and technological achievements with clinical research needs, accelerating the transformation of clinical research achievements, and releasing the potential of Shanghai's medical science and technology innovation and biomedicine science and technology innovation.

High-Level Faculty: The University's "Primary Resource"

Reviewing and summarizing ShanghaiTech's decade-long development process, interdisciplinary integration, integration of science, education, and industry, orientation toward major national needs, and service to national development strategies are inseparable from high-level faculty development. The discovery and cultivation of young scientific and technological talents are the driving force for the sustainable development of innovative research-oriented universities. The core of ShanghaiTech's faculty development is the tenure system implemented university-wide. Drawing on the experience of world-class universities and based

on the reality of Chinese universities, ShanghaiTech implements a tenure system that emphasizes faculty quality rather than the quantity of "titles," teaching performance rather than research alone, and research level rather than the number of achievements, focusing on whether research achievements serve major national needs. This tenure system can effectively support and protect basic research, align the positioning of new research-oriented universities with national development strategies, and help attract high-level overseas research talents, especially basic research talents.

ShanghaiTech provides young scholars with a relaxed environment and fertile soil. The university grants young researchers the right to choose their research topics, giving basic researchers the courage to engage in "cold bench" basic research. The university emphasizes the cultivation of young scholars, providing them with scientific and sustainable teaching and research resources and high-level career development platforms to help them quickly build relatively stable research teams and ensure their long-term development. After a decade of construction, the university has cultivated a group of young and middle-aged teachers who have become indispensable forces in strategic research teams. At the same time, the university's multidisciplinary integration has produced a batch of high-level research results. For example, the university has published 77 papers in authoritative journals such as *Cell*, *Nature*, and *Science*, 20 of which were published by young assistant professors as corresponding authors or first authors, fully demonstrating their strong academic potential.

High-Level Disciplines: Core Competitiveness

ShanghaiTech focuses on high-level discipline construction as its core, with the mission of serving national economic and social development strategies, characterized by "small but excellent" and "specialized" discipline construction, focusing on key fields such as new materials, new energy, human health, artificial intelligence, and integrated circuits. ShanghaiTech actively introduces outstanding domestic and international faculty and talents, builds high-level research platforms, strongly supports innovative scientific research, strengthens interdisciplinary integration, and continuously improves discipline construction quality and level. Currently, ShanghaiTech has formed advantageous discipline groups in physical sciences, life sciences, and information sciences, and established new discipline growth poles such as the School of Biomedical Engineering, Big Science Center, 2060 Institute, and Shanghai Clinical Research Center. These measures provide a solid foundation for ShanghaiTech's high-level discipline construction and lay a solid foundation for future scientific research and talent cultivation. At the same time, ShanghaiTech actively undertakes the construction of national large-scale scientific facilities. The hard X-ray free-electron laser facility, the largest domestically invested facility led by ShanghaiTech, has made significant progress in construction, forming a fully independent and controllable key technology development chain that has reached internationally advanced levels. Additionally, ShanghaiTech participates in the construction of

the Zhangjiang Comprehensive National Science Center and conducts in-depth talent cultivation and scientific research cooperation with the Zhangjiang National Laboratory, committed to becoming an important base for high-level graduate student cultivation.

In 2022, ShanghaiTech's "Materials Science and Engineering" discipline was selected as a national first-class discipline, which is one of the core constructions of the university's comprehensive interdisciplinary advantages. This discipline closely integrates teaching and research with the application of photon large-scale scientific facilities, forming unique characteristics and has achieved influential scientific research results in functional materials, biological macromolecular materials, and topological quantum materials.

Student Cultivation: The Top Priority

Student cultivation quality is the lifeline of university education and the most important work at ShanghaiTech. In undergraduate education and cultivation, ShanghaiTech has established the principles of "broad disciplinary exposure, solid foundation, small scale, and internationalization," highlighting the characteristics of "general (general education), specialized (professional talents), and new (innovation and entrepreneurship)," and continuously improving the cultivation system composed of general education, professional education, and personalized education. On this basis, ShanghaiTech emphasizes cultivating and strengthening undergraduate research capabilities, aiming to truly cultivate students into individuals with genuine research capabilities. Undergraduates can enter laboratories to participate in research projects in their first and second years and can take graduate courses in their third and fourth years.

In graduate student cultivation, ShanghaiTech emphasizes cultivating students' original innovation capabilities in scientific research practice while also focusing on "individualized cultivation" of graduate students, encouraging them to take courses across disciplines and schools. ShanghaiTech cultivates graduate students in conjunction with major scientific facilities and research projects, specially offering professional courses and lectures around large-scale scientific facilities, encouraging students to use advanced research platforms and cutting-edge technical means to conduct basic, strategic, and frontier scientific research with their supervisors. According to university statistics from the past three years, 60% of graduate students have participated in research projects related to the construction of the Shanghai Science and Technology Innovation Center.

ShanghaiTech actively promotes internationalized talent cultivation, committed to cultivating high-level innovative talents with international vision and competitiveness. To provide an internationalized educational environment, the university actively carries out cooperation and exchange programs with internationally renowned universities, encouraging students to participate in international conferences and short-term exchange and visiting programs to continuously expand their international vision and academic exchange capabilities. As of 2022,

ShanghaiTech has established cooperative relationships with world-class universities such as MIT, the University of Chicago, and UC Berkeley. Additionally, ShanghaiTech plans to continue expanding cooperation with other internationally renowned universities, striving to ensure that at least 50% of undergraduates have overseas study experience. These measures help cultivate talents with international competitiveness and vision to contribute to the country's innovative development.

Future Outlook: The Next Decade

ShanghaiTech, which began operating in 2013, has kept pace with the times. In 2014, President Xi Jinping proposed in Shanghai to build a science and technology innovation center with global influence. In 2015, Shanghai listed the construction of the science and technology innovation center as its "number one priority," and Zhangjiang Science City became the core carrier area for Shanghai's science and technology innovation center construction. Zhangjiang Science City is an important component of China's innovation-driven development strategy, gathering numerous high-tech enterprises and research institutions, including the Zhangjiang National Laboratory. In the new decade, ShanghaiTech will work closely with the Zhangjiang National Laboratory, fully leveraging its unique advantages to continuously promote high-level scientific and technological innovation and talent cultivation at the university. Seizing the opportunity of cooperation with the Zhangjiang National Laboratory, ShanghaiTech will continue to regard "Double First-Class" construction as an important development strategy, strengthening discipline construction and academic innovation in materials science and other fields, cultivating more academic leaders and high-level research teams, promoting interdisciplinary integration, and enhancing the university's overall academic level and influence.

In the next decade, ShanghaiTech will focus its efforts on three aspects: First, cultivating high-level scientific research achievements. With the support of the Zhangjiang National Laboratory, the university has already achieved important scientific research results in multiple fields, such as important breakthroughs in materials science, biology, and computer science. In the next decade, the university will continue to strengthen scientific research infrastructure construction, improve research capabilities and levels, cultivate more high-level research talents, and promote the transformation and application of the university's scientific research achievements. Second, transforming high-tech achievements. ShanghaiTech will strengthen cooperation with the Zhangjiang National Laboratory and surrounding technology enterprises, fully leveraging its unique resource advantages to accelerate the transformation of high-tech achievements and promote the university's innovation, entrepreneurship, and industrial development. Third, in terms of internationalization, ShanghaiTech will further deepen exchanges and cooperation with world-class universities and research institutions, actively recruit and cultivate international talents, expand the fields and levels of international cooperation, and continuously enhance the univer-

sity's international influence and competitiveness.

Looking ahead, ShanghaiTech will continue to deepen cooperation with various institutes of CAS in scientific research and student cultivation. ShanghaiTech will also fully leverage its location advantages, deeply integrate into the construction of Shanghai's science and technology innovation center and Zhangjiang Comprehensive National Science Center, act as a practitioner of integrating science and education and characteristic quality education, comprehensively improve the university's comprehensive educational level, and contribute to the innovative development of Shanghai and China.

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Note: Figure translations are in progress. See original paper for figures.