

**The 14th Five-Year Development Plan of
the College of Medical Instrument,
Shanghai University of Medicine & Health
Sciences**

College of Medical Instrumentation

November 15th,2021

I. Guiding Ideology and Development Objectives of the 14th Five-Year Plan

(1) Guiding Ideology

Under the correct leadership of the Party committee of the university, the School takes Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era as its guiding ideology, firmly strengthens the "Four Consciousnesses", adheres to the "Four Spheres of Confidence", and implements the "Two Upholds"; adheres to the path of socialist education development with Chinese characteristics and the orientation of socialist education. With the goals of rallying people's hearts, improving personality, developing human resources, cultivating talents, and benefiting the people, it aims to cultivate generation after generation of socialist builders and successors who support the leadership of the Communist Party of China and the socialist system of our country, are determined to strive for socialism with Chinese characteristics throughout their lives, and have an all-round development in moral, intellectual, physical, aesthetic, and labor education.

On the basis of fully achieving the development goals of the 13th Five-Year Plan, guided by the working principles of "quantifying the gap, improving quality, strengthening characteristics, and promoting cooperative development", the School launches the formulation of the 14th Five-Year Plan with high quality. Taking the period from now to 2030 as a strategic opportunity period for Healthy China Initiative, it is based in Shanghai, faces the whole country, and serves the national health industry; with the coordinated construction of medicine, engineering, and management as the foundation, it aims to cultivate engineering and technical application-oriented talents with "solid foundation, wide scope of knowledge, high quality, and strong capabilities" for the economic construction and health undertakings development in Shanghai, and becomes an important service base for regional economic growth and the progress of health undertakings.

The development plan of the School focuses on the strategic development needs of Shanghai's large health industry, such as geriatric rehabilitation and general practitioners. With discipline construction as the leading factor, enhancing scientific research capabilities as the key point, building a high-level team as the crucial link, and the application of medical device technology as its characteristic, it aims to build a talent cultivation base, a medical device research and development base, and an achievement transformation base with strong applied research capabilities and a close combination of "production, education, and research".

(2) Industry Analysis and Talent Demand Analysis

With the successful conclusion of the country's 13th Five-Year Plan construction and the comprehensive building of a moderately prosperous society in all respects, people's requirements for health and health services are constantly increasing. The modernization construction of hospitals is also booming. High-precision and cutting-edge medical equipment is continuously entering hospitals, and the role of medical equipment in improving medical technology is becoming more and more obvious. On the other hand, following the overall development trend of the country's industrial upgrading, the important role of high and new technologies in the development of the medical field, especially in the medical device industry, is constantly increasing. However, there is a relative shortage in both the quality and quantity of matching talent demand, which restricts to a certain extent the rapid development

of the large health industry. Especially in the cultivation of relevant talents for the "neck-sticking" key technologies in cutting-edge technologies and fields, the current domestic disciplinary layout and professional settings still need to make innovative breakthroughs.

The college will seize the excellent situation of the country's development of the health industry and the rapid development opportunities of the school's disciplines and majors, deeply explore the connotation of the cultivation of talents majoring in biomedical engineering (intelligent medical devices); develop applied undergraduate majors and education levels above the undergraduate level, and carry out research in the fields of intelligent medical devices and the regulatory science of medical devices; form its own characteristics in practice and achieve staggered development with relevant majors in other universities. Artificial intelligence, intelligent manufacturing, and Internet + healthcare will become key development areas of the country. Education in disciplines related to artificial intelligence will receive strong support from the state, and the demand for talents will show a breakthrough growth. The college will further integrate majors and disciplines, pool social resources, leverage development opportunities, and ride on the fast train of the strategic development of the national medical industry.

(3) Main Tasks and Development Objectives

In line with the requirements of the Shanghai Municipal Education Commission for the construction of undergraduate institutions, following the laws of higher education teaching and the growth of talents, highlighting the central position of talent cultivation, innovating the talent cultivation mechanism, optimizing the talent cultivation model, and focusing on cultivating various innovative, applied, and compound talents with a sense of historical mission and social responsibility, as well as rich innovative spirit and practical ability. In discipline construction, the team effect will be highlighted, and the ability to undertake social scientific research projects will be further enhanced; Substantial breakthroughs will be achieved in the reform of teacher education, and the teaching quality will be steadily improved; Focus on the development of undergraduate education and aim at professional degrees; Strive to become a first-class applied technology college with high-quality talent cultivation, strong competitiveness, and distinct characteristics in China.

The main development objectives are as follows:

In accordance with the principle of developing undergraduate education, the expected situation of majors in 2025 is as follows: There will be 4 undergraduate majors and 1 professional master's degree program, with the scale of students on campus being around 2,000. The graduate employment rate will rank among the top in the whole university, and the quality of talent cultivation will be fully recognized by the society.

Through 3 to 5 years of construction, the disciplines of biomedical engineering (intelligent medical devices) and medical product management in our college will be internationally renowned and have a certain influence domestically in 1 or 2 fields. One provincial and ministerial-level scientific research platform will be obtained, one new characteristic undergraduate major will be added, and one new professional master's degree program will be established. One new Shanghai-level excellent course will be added, 1 to 2 municipal-level teaching achievement awards will be obtained, 2 new municipal-level experimental projects and 1 national-level experimental project will be added, and one new

Sino-foreign cooperative undergraduate program will be established. The innovative ability of students will be significantly enhanced, and students will win at least 5 national and Shanghai-level awards in various competitions every year.

In terms of scientific research, by 2025, the annual scientific research funds received by the college will reach 10 million yuan, 50 Class I papers will be published every year, 6 projects at or above the provincial and ministerial level will be obtained every year, and more than 30 invention patents will be authorized every year.

In terms of the construction of the teaching staff, there will be 100 full-time teachers, and teachers with senior professional titles will account for more than 30% of the total number of full-time teachers, and teachers with a doctorate degree will account for 80%. One or two academic leaders at or above the municipal level will be introduced or cultivated; one or two new municipal-level famous teachers will be added; and one or two new Shanghai-level teaching teams will be established.

In terms of campus culture construction, the ideological and moral qualities, scientific and cultural qualities, and health qualities of all teachers, students and staff in the college will be significantly improved, and the level of spiritual civilization construction will remain in the advanced ranks of the university. Coordinate all aspects of teachers, teaching materials, and teaching, and implement education throughout the whole process by all staff in all aspects, making the integration of ideology and politics into courses an educational concept. Hold the main position of the Internet, and strengthen the content construction of the college's official website, official WeChat account, "Youth in Medical Instruments", Yiban and other online platforms. Utilize effective carriers such as club activities, class activities, and social practice activities to internalize the core socialist values in the heart and externalize them in actions.

In order to achieve the above goals, we must update our concepts, boost our spirits, forge ahead, work hard with all our might, create a new situation in our work, and achieve new breakthroughs in the development of the college.

II. Main Tasks and Strategic Measures to Achieve the Development Goals during the 14th Five-Year Plan Period

(I) Main Tasks and Key Work Specialty Construction

1. Major Construction

1) Specialty Positioning

In light of the requirements of Shanghai's economic, social and health undertakings development for talents in terms of knowledge, ability and quality, this plan studies the trends of higher education teaching reform and development, tracks the progress of international and domestic engineering professional accreditation work, and researches professional norms. Guided by the requirements of undergraduate engineering education, combined with the school's educational characteristics and the college's professional advantages, emphasizing practice and humanity, through the model of "school-enterprise cooperation, integration of medicine and engineering, and international cooperation", the talent training objectives and specifications are continuously improved. The training mode reform and teaching content update are carried out with the goal of cultivating abilities, especially learning ability and practical

ability, so as to cultivate biomedical engineering technical professionals who meet the needs of society. Strive to make the graduate employment rate rank among the top in the whole university, and ensure that the quality of talent cultivation is fully recognized by the society.

2)Specialty Planning

In line with the school's development plan, further rationalize the college's specialty layout. Taking medical devices as the main line and intelligence and supervision as the support, an intelligent medical device specialty group will be formed. The specialty scope covers the disciplines of biomedical engineering (intelligent medical devices), clinical engineering technology, data science and big data technology, and medical product management. Focus on the construction of biomedical engineering (intelligent medical devices).

2. Scientific Research Work

1)Research Areas and Characteristics

Further refine the college's professional characteristics and research areas. Through 3 - 5 years of construction, introduce about 15 talents at all levels, such as influential provincial and ministerial - level talents, academic backbones, and young and middle - aged talents from home and abroad. Form 2 - 3 influential medical device R & D teams in the industry, develop characteristics in research fields such as intelligent medical devices, medical device regulations and safety evaluation, and strive to reach the domestic advanced level and the first - class level among similar schools in Shanghai. Strive to obtain provincial and municipal - level scientific and technological awards, and obtain an average of 2 scientific research projects at or above the provincial and ministerial level per year. Establish 1 provincial and ministerial - level scientific research platform with domestic influence.

2)Scientific Research Projects and Funds

The grade of scientific research projects and the total amount of scientific research funds are important symbols to measure the level of scientific research. In the next five years, the proportion of vertical projects should be gradually increased, and the level of vertical projects should be improved. Strive to have 2 projects at or above the provincial and ministerial level every year. Gradually increase the annual scientific research funds received. Strive to achieve an average annual scientific research funds of more than 10 million yuan by 2025.

Centering around the college's discipline development, integrate the college's scientific research directions and focus on the following two aspects:

•Direction 1: R & D of Intelligent Medical Diagnosis Technology and Equipment

- **Task 1:** Innovation of common technologies for medical information processing, including research on intelligent methods for multi - channel human - machine interaction information fusion and research on common technologies for software design of intelligent medical cloud platforms.

- **Task 2:** R & D of intelligent medical diagnosis equipment products, including surgical robots, portable electromyographs, intelligent sleep state monitoring systems, and wearable hand exoskeleton systems.

• **Direction 2: Focus on Research of Medical Device Safety Evaluation and Policies and Regulations**

- **Task 1:** Focus on research of safety evaluation methods for respiratory anesthesia equipment and new technologies of respiratory anesthesia equipment.
- **Task 2:** Research on medical device safety evaluation and policies.

3)Scientific Research Achievements

Scientific research achievements are the core of reflecting the scientific research level. By 2025, obtain more than 1 provincial and ministerial - level scientific and technological achievement award on an annual average, publish 50 Class I papers, and authorize more than 30 invention patents.

4)Setting up of Research Institute Institutions

Attach importance to the role played by research institutes in the construction of professional disciplines, and plan to build 1 more provincial and ministerial - level scientific research platform.

5)Academic Conferences

Enhance the academic atmosphere through the approach of "inviting in and going out", and encourage teachers to participate in more domestic and international academic conferences. In the next five years, the college strives to host (undertake) 1 - 2 international professional academic conferences to expand the college's (discipline's) popularity in China and in the industry.

3. Teaching Work

1)Training Plan and Training Mode

Strengthen research and further study the professional training plan. Combine the school's educational orientation and the college's professional and disciplinary advantages and characteristics, optimize curriculum settings, deepen teaching reforms, focus on cultivating learning and practical abilities, pay attention to cultivating students' innovative awareness, and improve students' comprehensive qualities.

Based on the talent cultivation concept of "emphasizing practice and humanity", through the model of "school - enterprise cooperation, integration of medicine and engineering, and international cooperation", continuously improve the talent cultivation objectives and reform the talent cultivation mode. Establish a professional curriculum system according to the development trend of professional disciplines and the needs of structural adjustment. Select professional core courses carefully and set up curriculum modules flexibly to build a cultivation system that can reflect students' individual development. Actively adapt to the requirements of society and the health industry for students' knowledge and abilities.

2)Curriculum, Teaching Material and Courseware Construction

Strengthen curriculum construction. The reform of the curriculum system and curriculum content should be taken as the core. Through the construction of excellent courses and key courses, drive the improvement of the quality of professional courses in an all - round way. By 2025, strive to add 1 Shanghai - level excellent course, 2 Shanghai - level key courses and 3 school - level key construction courses.

Strengthen the construction and management of teaching materials. Increase the financial support and rewards for teaching material publication, and encourage teachers with rich teaching experience and high academic level to compile teaching materials. Within five years, publish more than 3 national - planned teaching materials or provincial and ministerial - level key construction teaching materials. Standardize the selection of teaching materials. For major courses, select teaching materials that have won awards at or above the provincial level or are recognized as high - level, and actively select new teaching materials published in the past three years.

Actively use modern teaching means and encourage teachers to carry out the construction of online courses to provide a platform for students' independent learning and teacher - student communication. By 2025, more than 50% of the courses should have characteristic online teaching platforms.

4. Teaching Staff

Teachers are the main force for the construction and development of the college. The construction of the teaching staff is the core issue and top priority of the college's work, which is directly related to the college's teaching quality and scientific research level. The whole college should deepen the understanding of "strengthening the college with talents" and actively create conditions to accelerate the construction of the teaching staff.

1)Total Quantity Expansion

The total number of teaching staff in the college is insufficient, especially the shortage of high - level academic backbones and discipline leaders. The shortage of teaching staff has become the biggest "bottleneck" affecting the development of the college. The college must, through attractive and competitive policies and conditions, effectively increase the intensity of introducing high - level talents.

2)Structural Optimization

Pay attention to the optimization of the structure of professional titles, academic qualifications, ages and academic origins in talent introduction. Focus on introducing outstanding teaching staff with industry backgrounds, medical engineering backgrounds and overseas backgrounds. Through introduction and cultivation, continuously improve the structure of the teaching staff, improve the overall level of teachers, and strive to form a high - level teaching staff with an optimized structure, good quality and full of vitality.

By 2025, there will be 100 full - time teachers. Teachers with senior professional titles will account for more than 30% of the total number of full - time teachers, and teachers with a doctorate degree will account for 80%. One

or two academic leaders at or above the municipal level will be introduced or cultivated; one or two new municipal - level famous teachers will be added; and one or two new Shanghai - level teaching teams will be established.

(II) Strategic Initiatives and Guarantee Measures

1. Formulate Key Development Goals for Each Major

According to the overall professional layout and development plan of the college, combined with the development needs of the industries in which each major is located and the development direction of the disciplines, formulate the key development goals for each major as follows:

1)Biomedical Engineering Major: Based on optics, machinery, and electronics, combined with electrophysiology, wearable technology, intelligent manufacturing and other technologies, obtain approval for a municipal - level engineering research center; Construct an application - oriented undergraduate major with new engineering and application - oriented characteristics for the design, manufacturing, and service of intelligent medical devices.

2)Clinical Engineering Technology Major: Taking the clinical application of medical devices as the scenario, focusing on relevant core technologies, and taking the application and safety management of complex medical device systems such as respiratory anesthesia and emergency surgery as the core tasks, construct an application - oriented undergraduate major that serves clinical needs and meets international standards. Obtain approval for a Sino - Japanese cooperative undergraduate program.

2. Clarify Professional Development Measures

On the basis of the professional construction during the 13th Five - Year Plan period, clarify measures and steadily promote to strive for breakthroughs. The main work includes the following aspects:

1. Take the construction of the applied undergraduate pilot major as an opportunity to build the "Intelligent Medical Electronics Laboratory", improve the construction of professional core courses, and organize the compilation of 3 - 5 teaching materials suitable for the teaching needs of undergraduate majors.

2. Actively promote the curriculum construction of each major and complete 2 - 3 curriculum construction projects at or above the municipal level.

3. Continuously carry out international professional accreditation work and strive to pass the accreditation.

4. Further strengthen the professional influence. Based on professional construction, hold influential municipal - level teaching and scientific research conferences.

5. Hold or participate in competitions suitable for students of this major. For example, participate in the National College Students "Internet +" Innovation and Entrepreneurship Competition, the "Challenge Cup", etc.; Hold the China Robot Competition, etc.

6. Explore in - depth cooperation with the Clinical Medical College and the School of Nursing of our university. Build a teaching platform for the "intersection of medicine and engineering" of majors such as clinical engineering technology.

7. Further consolidate the discipline platform. Build a medical device policy research and safety evaluation center, apply for a medical device regulatory science research base of the Shanghai Municipal Drug Administration; Establish a training base for professional inspectors of medical devices of the National Medical Products Administration; Continue to take medical device policy research and safety evaluation as the two major research fields of discipline development to improve the scientific research level.

3. Ensure Developmental Indicators

1. Strengthen discipline construction and make breakthroughs in national - level scientific research projects such as the National Natural Science Foundation. The scientific research funds, transformation of scientific research achievements, and the number of papers should increase by 50% compared with the 13th Five - Year Plan period.

2. Each major should introduce 3 - 5 high - level talents to optimize the teaching staff and enhance the team strength.

3. Each major should build 1 - 2 Shanghai - level key courses, 1 - 2 Shanghai - level excellent courses, 1 - 2 Shanghai - level education reform projects, and 1 - 2 Shanghai - level high - quality online courses.

4. Each major should compile and publish a series of technical professional teaching materials to form a professional teaching material system.

5. Expand cooperation with the University of Hertfordshire in the UK, complete the 2 + 2 joint undergraduate training program and the "4 + 1 master's program" to establish a bachelor - master channel.

6. Hold 2 - 3 national - level academic conferences with a certain influence.