

## Research Article

# Intelligent Optimization Method of the Higher Vocational Education System for Labor Market Demand in Guangdong-Hong Kong-Macao Greater Bay Area

Jiayan Li and Zhedong Wei 

*Guangdong Mechanical and Electrical Polytechnic, Guangzhou, Guangdong 510515, China*

Correspondence should be addressed to Zhedong Wei; [weizhedong@gdmec.edu.cn](mailto:weizhedong@gdmec.edu.cn)

Received 16 August 2022; Revised 8 September 2022; Accepted 16 September 2022; Published 13 October 2022

Academic Editor: Lianhui Li

Copyright © 2022 Jiayan Li and Zhedong Wei. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

The current educational development in the Guangdong-Hong Kong-Macao Greater Bay Area is not enough to support the construction of a world-class bay area, so the education reform and innovation in the Greater Bay Area face many challenges. This study systematically sorts out the challenges faced by education in the Guangdong-Hong Kong-Macao Greater Bay Area, starting from the interpretation of the talent training standards in the new era, and proposes that the education innovation in the Guangdong-Hong Kong-Macao Greater Bay Area should re-understand and implement the national education right of the SAR, improve the standards and raising quality of talents, and strengthen innovation-driven development, and an education system with the characteristics of the Greater Bay Area should be built to give full play to the role of education in regional economic development and to cultivate talents in the new era.

## 1. Introduction

In 2012, the Central Talent Work Coordination Group approved the Guangzhou Nansha-Shenzhen Qianhai-Zhuhai Hengqin Guangdong-Hong Kong-Macao Talent Cooperation Demonstration Zone as a National Talent Management Reform Pilot Zone [1]. The service industry is a pillar industry in the Greater Bay Area which requires a large number of high-quality labor input. In the future development orientation of the Guangdong-Hong Kong-Macao Greater Bay Area, the development of emerging industries and advanced manufacturing also requires the support of a large number of high-level talents. It has built a global high-tech innovation highland and an important source of emerging industries, which puts forward higher requirements for education in the Guangdong-Hong Kong-Macao Greater Bay Area [2].

At present, the entire Guangdong-Hong Kong-Macao Greater Bay Area is facing enormous pressure from industrial upgrading, and the existing industrial structure is

facing low-end dilemma and unbalanced dilemma. The so-called low-end dilemma refers to the development of traditional manufacturing industries to high-end manufacturing and innovative industries faced by the Greater Bay Area. According to the Report on Influence of the Four Great Bay Areas (2018) released by the Institute of Financial and Economic Strategy of the Chinese Academy of Social Sciences and the Sun Yat-sen Research Institute, the Guangdong-Hong Kong-Macao Greater Bay Area's innovation basic indicators and innovation capability indicators are ranked at the bottom of the four major bay areas. The overall development quality and innovation level of the Hong Kong-Macao Greater Bay Area still has a certain gap compared with that of developed countries. The so-called unbalanced dilemma refers to the problem of unbalanced or unbalanced development in Guangdong, Hong Kong, and Macau. There is a large gap in development within the Greater Bay Area where synergy and inclusiveness need to be strengthened, and there is still homogeneity in some regions and fields. The mismatch between competition and

resources has led to the lack of sustained and stable support for Hong Kong's economic growth. Macao's economic structure is relatively single, and its development resources are limited. The market economic system of nine cities in the Pearl River Delta needs to be improved. Facing the dilemma of economic development in the Guangdong-Hong Kong-Macao Greater Bay Area, on the one hand, we must focus on improving the quality of education in the Guangdong-Hong Kong-Macao Greater Bay Area and cultivate more high-level talents; on the other hand, we must integrate the educational resources in the Guangdong-Hong Kong-Macao Greater Bay Area to avoid mutual the increasing alienation and bad competition between them, realize the collaborative innovation of education, and create a first-class education in the Bay Area [3].

There are two systems in the Guangdong-Hong Kong-Macao Greater Bay Area, including three customs areas and four core cities, involving nine cities and one urban agglomeration. Facing the complex background of multiple systems in one district, we must face up to the weak links in the past institutional design to meet the requirements of governance capability and modernization of governance system [4]. Under the basic national policy of one country, two systems, Hong Kong and Macao enjoy great regional autonomy including the right to education after their return, which has largely led to the lack of national education in the special administrative region. Especially in Hong Kong, the problem of youth ideological education is particularly prominent. From the Occupy Central illegal assembly in Hong Kong in previous years to the demonstrations and riots that broke out in Hong Kong after the revision of the Fugitive Offenders Ordinance in 2019, there were a large number of Hong Kong youths who blocked traffic in the name of fighting for freedom carrying out illegal acts of violence such as beating citizens, arson, occupation of universities, and refusing to recognize their Chinese identity. Behind the Hong Kong Independence ideology and violent behavior is the problem of education in Hong Kong [5]. Hong Kong and Macao governments lead the formulation of education policies in the Special Administrative Region, and from the perspective of Hong Kong's educational practice, the implementation of national education in Hong Kong has been greatly hindered. In 2010, the Hong Kong Special Administrative Region Government proposed to add national education and moral education courses as compulsory courses in primary and secondary schools, but it was shelved indefinitely due to the accusation of political brainwashing by the opposition [5]. In the sense of pragmatism and desinicization left by the colonial era in Hong Kong, the anti-Communist consciousness left by the Cold War system in Hong Kong, and the anti-mainland nation consciousness of new nativism, now we urgently need to strengthen the awareness of National ethnic identity and cultural identity education for young people in the Special Economic Zone. The return of Hong Kong and Macau to the motherland is only a return in terms of legal principles, but to realize the return of people's hearts and to truly unite the people of the three places on both sides of the strait and seek common development, we must pay attention to the role of education.

The system design in the past did not pay enough attention to the education of the special administrative region, which is a weak link that needs to be paid attention to in the future education reform and innovation of the Guangdong-Hong Kong-Macao Greater Bay Area [6].

Throughout the world, the center of economic development is often the center of education. To achieve the strategic goal of building a dynamic and internationally competitive first-class bay area and world-class city cluster, it is necessary to focus on building an education center in the Guangdong-Hong Kong-Macao Greater Bay Area to realize cooperative development, shared development, and integrated development of the three places. At present, the integration and complementarity of the education systems of Guangdong, Hong Kong, and Macao still face great challenges. In terms of the educational model, Hong Kong follows the British and American educational models while Macau follows the Portuguese and European educational models. In terms of the management system, the cooperation in running schools in the Guangdong-Hong Kong-Macao Greater Bay Area needs to be governed by the Regulations on Sino-foreign Cooperative Education, and the barriers to joint training and the flow of teachers and students in the three places need to be further broken down. In terms of educational development level, educational resources and higher education strength between cities are uneven [7]. High-level research universities are concentrated in Hong Kong and Guangzhou. The gap in school-running strength has hindered the integration of the education systems of the three places to a certain extent. At the level of cooperation, student exchanges and scientific research cooperation in the Guangdong-Hong Kong-Macao Greater Bay Area are mostly spontaneous interactions between schools, lacking top-level design and in-depth exchanges [8]. Expanding cooperation models, establishing cooperation platforms, realizing resource sharing and complementary advantages, and forming an educational community will be important measures for the development of education in the Guangdong-Hong Kong-Macao Greater Bay Area.

To build a talented highland in Guangdong, Hong Kong, and Macao, it is also necessary to remove several obstacles in the flow of talents and coordinated development. Firstly, the social and legal systems of Guangdong, Hong Kong, and Macao are different, and they belong to different tariff areas. Secondly, the level of market connectivity needs to be improved. The low degree of connection between social and public services such as medical care has brought certain obstacles to the cross-regional work and life of residents in the three places. Thirdly, the current construction of carrier platforms such as large-scale scientific installation platforms, innovation and entrepreneurship bases, and incubators in the Guangdong-Hong Kong-Macao Greater Bay Area finds it difficult to meet the need of coordinated development of talents. Lastly, the survey shows that Hong Kong has a low degree of recognition of the overall development concept of the Guangdong-Hong Kong-Macao Greater Bay Area, and there is less flow of talents from Hong Kong and Macao to the mainland. If the specific obstacles in these practices cannot be removed, it will be difficult to form a talent flow

and coordinated development system in the entire Guangdong-Hong Kong-Macao Greater Bay Area [9]. Figure 1 shows research technology roadmap.

## 2. Research Methods

This study mainly adopts literature research method, comparative research method, field investigation method, and interview method for research. The specific research ideas are as follows.

*2.1. Literature Research.* Literature research is mainly carried out in two forms online and in the field. In terms of network, it is mainly conducted through CNKI, Google Scholar, and Taiwan Huayi Literature Database; in terms of field, it is mainly conducted with the help of Guangzhou Library, Taiwan Yishou University Library, Taiwan Kaohsiung Municipal Library, Hong Kong Central Library, etc., understanding the research progress, rationalizing the research background, and finding problems through the way of studying, consulting, collating, and analyzing the literature at home and abroad and related data, so as to provide the literature support for the thesis research.

*2.2. Comparative Research Method.* By comparing the training systems of vocational exhibition professionals in Guangdong, Hong Kong, Macao and Taiwan and combining the current situation and development trend, the research puts forward reform measures. This study follows the expression and connotation of Guangdong in the Guangdong-Hong Kong-Macao Greater Bay Area Development Plan; that is, Guangdong refers to nine cities in Guangdong Province, which are referred to as Guangdong nine cities in the study [10].

### 2.3. Fieldwork

*2.3.1. Survey Conditions.* The researcher has been engaged in vocational education in Guangzhou for many years and participated in many exhibitions in Guangdong, Hong Kong, Macao, and Taiwan. He has studied in Hong Kong for two semesters and in Taiwan for one semester. Through the observation, reflection, and summary of his own work, study, and field research, he further explores the research content of this study.

*2.3.2. Investigation Stage.* The specific field investigation work is divided into three stages: preliminary preparation, on-site investigation, and sorting and analysis.

*2.3.3. Survey Outline.* The field investigation method mainly focuses on the exhibition industry and exhibition vocational education. The specific content of the survey outline is as follows.

First, participate in and experience local exhibition activities, intuitively feel and understand the development of the local exhibition industry, especially pay attention to

comparing the development of similar exhibition activities in Guangdong, Hong Kong, Macao, and Taiwan, and communicate with industry personnel.

Second, inspect local vocational education-related institutions, go as far as possible into the classroom, collect relevant public information on the spot, and interact with relevant personnel.

### 2.4. Interview Method

*2.4.1. Semistructured Interview.* The semistructured interview method used in this study is mainly based on the following considerations.

Compared with the questionnaire survey, the interview method can better judge the authenticity of the respondent's views and answers through the details of gestures, expressions, and language during the interview process. The semistructured interview method is more flexible which can timely raise more questions and conduct in-depth interviews that can obtain more useful information according to the answers of the interviewees. In addition to general interviews, key person interviews are also used to obtain professional information more efficiently. For example, the researchers made in-depth interviews with the pioneers of Taiwan's exhibition industry and interviewed the general manager of Taiwan's first professional large-scale exhibition company, the outstanding new generation and young representatives of Taiwan's convention, and exhibition industry through appointment interviews. Taiwan's exhibition industry at the food exhibition was held at the Kaohsiung Exhibition Center in Taiwan through interview reservations.

*2.4.2. Reliability and Validity.* The first is reliability. In order to improve the validity of the interview, after the interview, the researcher will search the relevant materials of the interviewed experts and scholars from literature, collections of papers, industry journals, news reports, etc., and sort out and analyze whether their opinions are consistent with the interviews. The reliability of the interview results was insufficient, and the interview was canceled.

The second is validity. In this study, an interview outline was drawn up, and the interview process was based on standard questions, which was more effective than unstructured interviews. In addition, through the study and practice of interview skills before the interview, the researcher tries to ask questions accurately and objectively, so as to avoid guiding the interviewee's answer and improve the validity of the interview.

*2.4.3. Preparing for the Interview.* Adequate preparation can improve the efficiency and quality of interviews, help establish a good interview relationship, and ensure the smooth progress of the interview process. The pre-interview preparations in this study include the following: clarifying the purpose and content of the interview, designing the interview outline, screening and determining the scope and object of the interview, establishing the interview

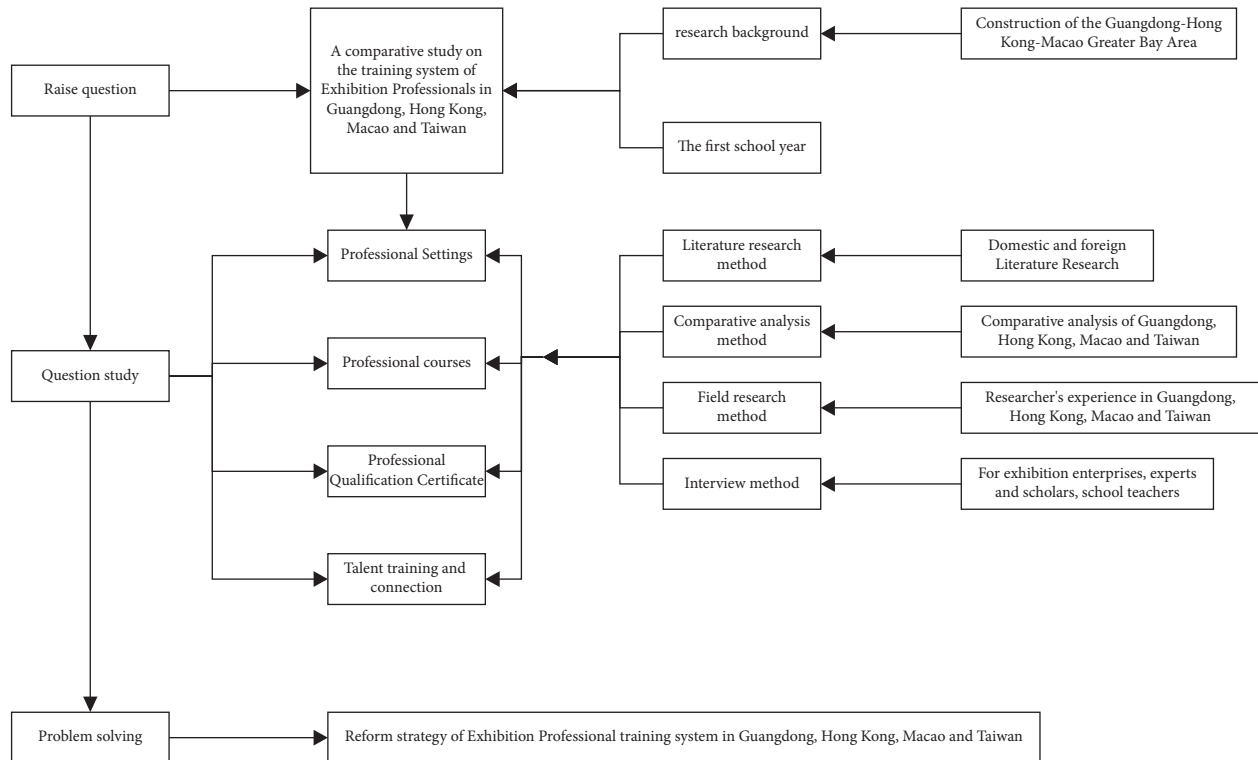


FIGURE 1: Research technology roadmap.

relationship, and determining the specific time and place of the interview.

**2.4.4. Interview Content and Outline.** The content of this interview mainly focuses on the following three aspects: the impact of the planning and development of the Guangdong-Hong Kong-Macao Greater Bay Area on the exhibition industry, the impact on the training of exhibition professionals, and the requirements for talents in the exhibition industry. The detailed interview outline can be found in the appendix.

**2.4.5. Interview.** The interview objects are mainly determined by nonprobability sampling. The selection is closely related to the research content and can provide the most effective information for the interview questions. The specific interview objects include representatives of enterprises in the exhibition industry, teachers of secondary vocational exhibition majors, or related courses. The regions where the interviewees are located include nine cities in Guangdong, Hong Kong, Macau, Taiwan, and other cities with developed exhibition industries, such as Beijing and Shanghai, in order to obtain interview conclusions from a more comprehensive and objective perspective.

**2.4.6. Interview Specific Method and Process.** In this study, the interview samples were numbered first, and the interview sample areas were coded with English capital letters. *Y*, *H*, *M*, and *T* represent Guangdong and nine cities, Hong Kong,

Macao, and Taiwan, respectively; *O* represents other developed exhibition cities in China outside Guangdong, and this study selected industry experts in Beijing, Shanghai, and Wuhan as interview subjects. The interview samples were coded in Arabic numerals. Accordingly, the sample code is a two-digit combination of English and Arabic numerals. For example, *H1* represents Interviewer 1 in Hong Kong, *M2* represents Interviewer 2 in Macau, and so on. In addition, the researchers took advantage of the opportunity of the exhibition teachers of Suiyi Shou University to inspect the Kaohsiung Tourism Fair on October 24, 2019, and interviewed the pioneers, leading figures, and outstanding employees of the exhibition industry in Taiwan. On January 12, 2020, at the time of the annual meeting of the National Convention and Exhibition Service Providers of Guangzhou Xuanzhan Culture Communication Co., Ltd., interviews were conducted with the senior management of the exhibition service company.

### 3. Definition of Related Concepts

**3.1. Professional Degree.** At present, the more generally accepted definition of professional degrees in academic circles is as follows: professional degrees are the type of degrees relative to academic degrees, which are mainly used to cultivate application-oriented high-level professionals who can adapt to social development or occupational practical work needs and have a solid theoretical foundation. Professional degrees have obvious three characteristics: professional, academic, and research, and the three characteristics complement and interact with each other.

Professional degrees and academic degrees are postgraduate education at the same level with different training requirements, and together they form the current postgraduate education structure in my country [11]. By sorting out the full-time master's degree in Guangdong, Hong Kong, and Macao universities, first of all, the master's degree in colleges and universities is divided according to the way of study. Guangdong can be divided into full-time and part-time, and Hong Kong and Macao can be divided into full-time and part-time. Since the part-time university master's degree in Hong Kong and Macao is limited to the residents of Hong Kong and Macao, this paper studies the master's degree in full-time universities. Secondly, due to the differences in educational systems and cultural backgrounds between Hong Kong and Macao and Guangdong, the taught degree in Hong Kong and the development-oriented degree in Macao correspond to the professional master's degree in universities in Guangdong. Finally, the master's degree in mainland colleges and universities is also divided into four professional directions: college teaching, sports training, social college guidance, and competition organization. At present, the four colleges and universities in Guangdong have no admissions for master's degrees except for the direction of competition organization. South China Normal University, Guangzhou University College, and Guangzhou University are involved in the other three directions. South China University of Technology currently only has one direction of college teaching. Compared with the Guangdong region, the professional direction setting of the master's degree in the universities in Hong Kong and Macao is relatively simple. In addition to the Chinese University of Hong Kong's professional setting for master's degrees, the other four universities in Hong Kong and Macao have only one professional setting for master's degrees [12].

### 3.2. Professional Degree Postgraduate Training Mode.

Professional degree postgraduate training model refers to the process of postgraduate training in order to meet the needs of the society for high-level, compound, and applied professionals under the guidance of the educational ideals and educational concepts of classified training and to achieve the training goals of professional degree postgraduates [13].

The current academic circles hold different viewpoints on the constituent elements of the professional degree postgraduate training model, mainly including the three-element theory, four-element theory, five-element theory, six-element theory, and multielement theory. By inquiring about relevant literature and meeting the needs of this research, the main components of the training mode of professional degree graduate students in this study are divided into three aspects: training objective, training process, and quality evaluation.

**3.2.1. Training Objectives.** The training goal of professional degree postgraduates is to enable the training objects to achieve the required requirements and standards in knowledge, ability, and quality structure through training

activities in a certain way and within a certain period of time. The training goal defines the training direction and is the guiding element of the training model. Clarifying the training objectives is the premise of professional degree graduate education, which answers the question of what kind of graduate students to train, and is also the starting point and destination of professional degree graduate students in the entire training activities.

**3.2.2. Cultivation Process.** The training process of professional degree postgraduates is the core of the professional degree graduate training model. It mainly answers the question of how to train people. It includes admissions system, admission requirements, training years, professional settings, teacher characteristics, professional practice, graduation thesis and requirements, related facilities conditions, and many other aspects.

**3.2.3. Quality Evaluation.** The quality evaluation of professional degree postgraduates is to objectively consider and judge the quality and benefits of personnel training according to the corresponding standards, to test and monitor the training objectives and processes, to understand the current situation and problems of training quality in a timely manner, and to accumulate experience and draw lessons and make timely feedback and adjustments. The evaluation of the training quality of professional degree postgraduates generally starts from the perspective of internal and external quality. The internal quality concept refers to the evaluation of the quality of professional degree postgraduate training by the postgraduate training unit itself. The evaluation methods generally adopt three methods, assessment system, practical learning, and thesis quality assessment, to ensure the quality of professional degree graduate training. External quality view means that the quality of postgraduates will be evaluated by organizations, societies, and individuals outside the postgraduate training unit. Quality evaluation will run through the whole process of professional degree postgraduate training, and it is the backbone guarantee for whether professional degree postgraduate education can achieve its goals [14].

Among the elements of the entire professional degree postgraduate training model, the three elements are interconnected, influenced, and promoted each other, which are the more important and indispensable elements among the many elements of the professional degree graduate training model. The cultural and social background and the products under the actual situation have distinct characteristics of the times and will be adjusted with the changes of the needs of the times, and they will vary according to different majors. Therefore, we should adjust the training accordingly according to the specific situation in the practice model. Figure 2 shows the logical relationship diagram of the professional degree postgraduate training model.

Our observation of the system of professional degree graduate training mode corresponds to at least the following three subsystems: training objectives, training process, and quality evaluation. Taking the postgraduate training model

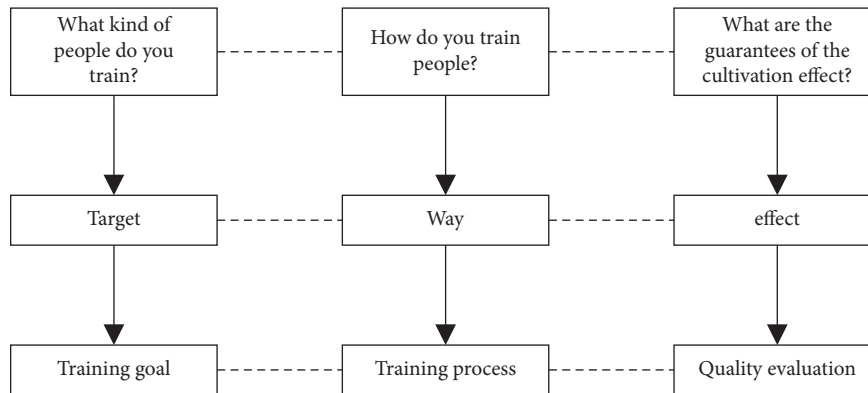


FIGURE 2: The logical relationship diagram of the professional degree postgraduate training model.

for master's degree as a system, the explanations of the relevant elements are as follows:

- (1) Training objectives: the training objectives of post-graduates with professional degrees in higher vocational education belong to the decisive elements, and the decisive elements define the overall development direction of personnel training, play a leading role among many elements, and are the premise of constructing the training system, training process, facility conditions, and quality evaluation and basis.
- (2) Cultivation process: the training process of professional degree graduate students in higher vocational education, as the core part of sports talent training, is a normative element in the entire training system. The main connection is how to achieve the training goal and whether the training activities of professional degree graduate students in higher vocational education can be carried out smoothly important guarantee. Generally, it includes the student system, admission requirements, training years, professional settings, teacher characteristics, curriculum settings, practical links, graduation thesis and requirements, and related facilities conditions.
- (3) Quality evaluation: the quality evaluation of professional degree postgraduates in higher vocational education has typical feedback characteristics, and the feedback of training quality information runs through the entire training model and belongs to the controlling element. The quality of talent training is scientifically measured by adopting certain evaluation standards for various situations in the training process. Quality evaluation generally includes course assessment, student source quality, tutor status, employment status, collaboration platform, and international cooperation.

Among the elements of the training mode for post-graduates of professional degree in higher vocational education, the three elements interrelate, interact, and promote each other. The products under certain cultural and social backgrounds and actual situations have distinct characteristics of the times. Therefore, in practice, we should adjust

the training mode accordingly according to the specific situation. Figure 3 shows the implementation approach of higher vocational students' ability training.

#### 4. Positioning of the World Regional Higher Education Center

*4.1. An Integrated Framework for the Positioning of Higher Education in the Guangdong-Hong Kong-Macao Greater Bay Area.* Higher education in the Guangdong-Hong Kong-Macao Greater Bay Area plays an important supporting role in the construction of the Greater Bay Area urban agglomeration, the construction of an international technology innovation center, and the realization of national regional development strategies. Under the historical opportunity of the construction and development of the Guangdong-Hong Kong-Macao Greater Bay Area, the positioning and development of higher education have long-term strategic significance [15].

In Figure 4, the social development of the Guangdong-Hong Kong-Macao Greater Bay Area is a system as a whole, and higher education, as a subsystem, intersects with other subsystems such as politics, technology, politics, and culture [16]. Throughout the world's development experience, economic centers, technology centers, and higher education centers are often accompanied by and complement each other.

From the perspectives of the realistic demands of the economic and social development of the Guangdong-Hong Kong-Macao Greater Bay Area for higher education, the current situation of higher education in the three regions, and the development experience of higher education in the three major bay areas in the world, the construction of the Guangdong-Hong Kong-Macao Greater Bay Area has an impact on higher education [17]. According to the needs of development, combined with the actual situation of higher education, it is inferred that there should be a leading strategic goal for the cooperation and development of higher education in the Guangdong-Hong Kong-Macao Greater Bay Area [18]. Specifically, the first is the three levels of innovation, talents and cooperative development proposed by the industrial system, technology, and political and cultural development of the Guangdong-Hong Kong-Macao

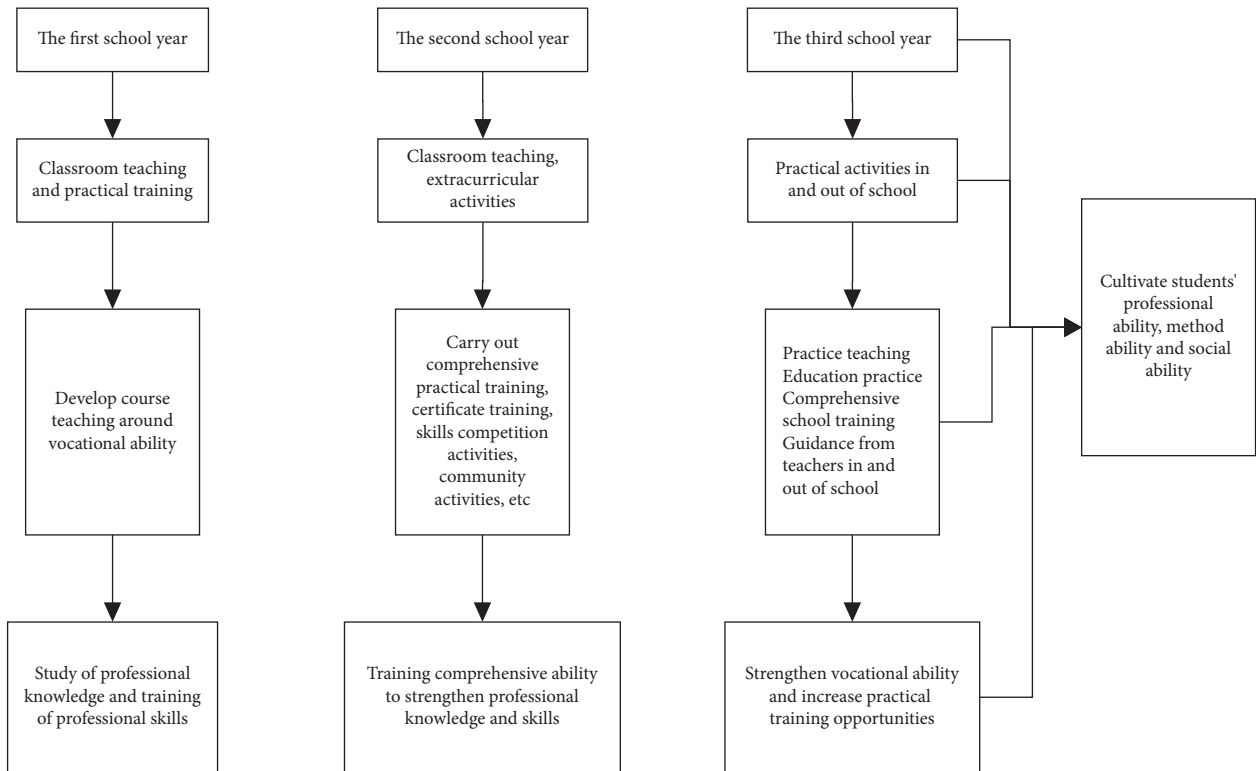


FIGURE 3: The implementation ways of higher vocational students' ability cultivation.

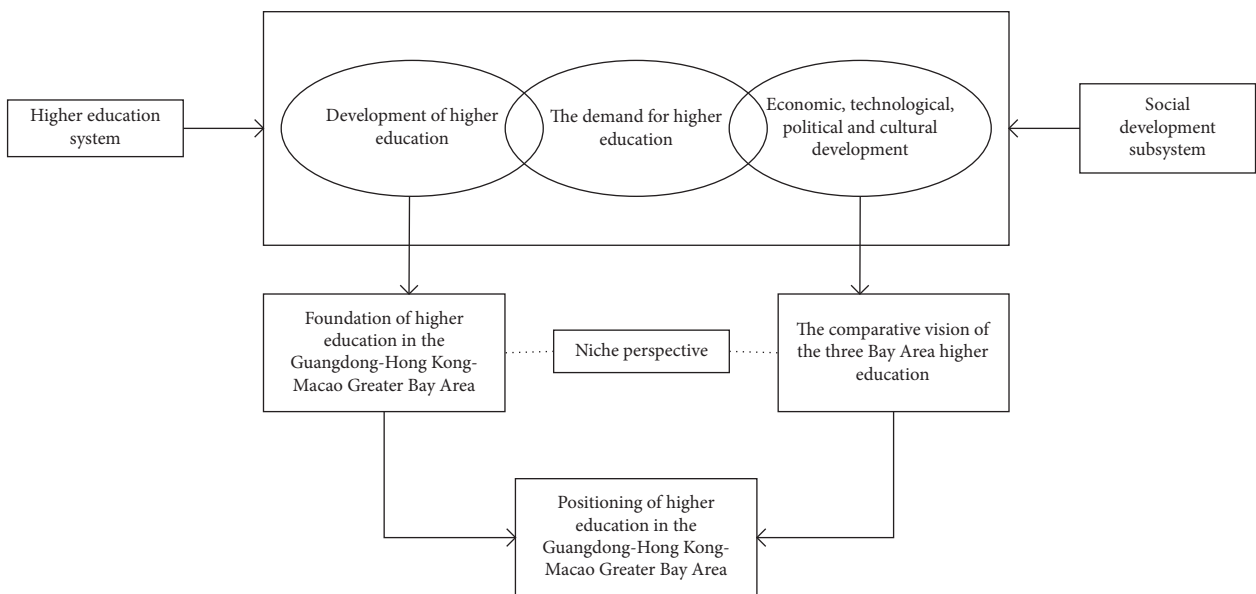


FIGURE 4: An integrated framework for the positioning of higher education in the Guangdong-Hong Kong-Macao Greater Bay area.

Greater Bay Area for higher education; the second is the interactive experience of the cooperation model on the regional economy and society; thirdly, the development of higher education in Guangdong, Hong Kong, and Macao has its own constraints and is highly complementary. This

strategic goal not only needs to play the supporting role of higher education in cultivating high-quality talents but also to lead the cooperative development of higher education in the three places, to provide cutting-edge technology and innovative collaborative development.

4.2. *The positioning of higher education in the Guangdong-Hong Kong-Macao Greater Bay Area.* Therefore, the development of higher education in the Guangdong-Hong Kong-Macao Greater Bay Area should have a specific and implementable target orientation [20]. Based on the locality and forward-looking nature of higher education positioning goals, the Guangdong-Hong Kong-Macao Greater Bay Area higher education positioning goals should not only focus on the existing higher education foundations in the Greater Bay Area, focus on the discussion and attribution of problems, but also recognize that Guangdong, Hong Kong and Macao Higher education in the Greater Bay Area is in a strategic position beyond the regional or national level, and finally proposes the goal of positioning higher education in the Guangdong-Hong Kong-Macao Greater Bay Area [21]. To this end, taking the construction and development of the Guangdong-Hong Kong-Macao Greater Bay Area as an opportunity, with a longer-term strategic vision, a broader international vision and a more advanced planning layout, to support the higher education in the Guangdong-Hong Kong-Macao Greater Bay Area to be at the forefront of the world.

#### 4.3. *The Development of Higher Education in Guangdong, Hong Kong, and Macao from the Perspective of Ecological Niche*

- (1) There are few internationally renowned universities, and the level of internationalization needs to be improved (the following data are from the official website and published in 2019)

In the ranking of American News World Universities in 2019, a total of 14 universities in Guangdong ranked on the list. Among the 14 universities, Sun Yat-sen University and South China University of Technology ranked the top 500, ranking 208 and 336, respectively. In the QS World Ranking in 2019, there are 7 universities in Guangdong. Among the 7 universities, only Sun Yat-sen University has entered the top 500, ranking 295 in the world. In the World University Ranking in 2020, a total of 8 universities in Guangdong were listed, of which only Sun Yat-sen University and Southern University of Science and Technology ranked in the top 500. The world rankings are 251–300 and 301–350, respectively. In the ARWU World Ranking in 2019, a total of 11 universities in Guangdong were selected, of which 5 were ranked among the top 500 in the world, including Sun Yat-sen University (101–150), South China University of Technology (201–300), Shenzhen University (301–400), Jinan University (401–500), and South University of Science and Technology (401–500). It can be seen that although there are many colleges and universities in Guangdong Province, not many universities enjoy international reputation. According to the world university rankings released by US News, QS, and the ARWU, only Sun Yat-sen University can enter the top 500 of

the mainstream world university rankings, but the ranking is not very high. In Hong Kong, there are five top 100 universities in the world, including the University of Hong Kong, the Hong Kong University of Science and Technology, the Chinese University of Hong Kong, and the City University of Hong Kong. It can be seen that there are still relatively few internationally renowned universities in Guangdong Province. It is necessary to strengthen the construction of first-class universities and first-class disciplines, expand the international reputation and influence of Guangdong education, and better promote the development of the internationalization of higher education in Guangdong [19].

- (2) The level of cooperative education is lower and there are fewer majors

Guangdong Province has 9 Sino-foreign (mainland and Hong Kong, Macao, and Taiwan) cooperative educational institutions and 52 Sino-foreign (mainland, Hong Kong, Macao, and Taiwan) cooperative educational projects, including doctoral education, foreign bachelor's degree education, foreign master's degree education, foreign doctoral degree education, and other categories, but mainly at the tertiary level and undergraduate level, such as Sino-foreign cooperative projects (see Figure 5) accounting for 55.8% of the academic level and categories of institutions of higher learning, and 19.2% belong to the level and category of undergraduate education. The level of master's and doctoral education is relatively small, and the level of cooperative education is relatively low. The cooperative training of high-level talents needs to be further strengthened.

Among the cooperative educational institutions and projects, there are relatively few majors, and only a few majors are offered by Sino-foreign cooperative educational institutions without legal personality. For example, the Sun Yat-Sen University-Carnegie Mellon University Joint School of Engineering only offers electronic and computer engineering majors; the Sino-French School of Nuclear Engineering and Technology of Sun Yat-sen University only offers nuclear engineering and nuclear technology majors for undergraduate education, and nuclear energy and nuclear technology engineering majors only for postgraduate education. Sino-foreign (mainland, Hong Kong, and Macao) cooperative education programs mainly focus on economic management and business management is the main category, and other majors in science and engineering are relatively few, and it is necessary to further develop a variety of majors and courses [22].

In addition, the number of cooperative education institutions and projects in Guangdong Province is still relatively small, and there are not many local colleges and universities participating in cooperative education which needs to be further widen.



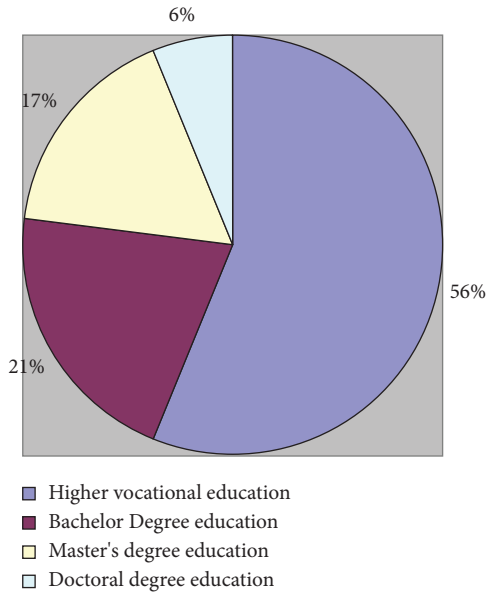


FIGURE 5: Scale chart of sino-foreign cooperation projects in Guangdong Province.

- (3) The school-running system is not flexible enough, and market forces are not involved enough

Professor Lu Xiaozhong believes that since the reform and opening up, Guangdong's education internationalization has achieved certain achievements, but Guangdong's level of education internationalization is much lower than its level of economic internationalization. Educational decision-making is not open enough, and the school operation system is not flexible enough. The system is not yet perfect lacking social participation and marketization. At present, Guangdong colleges and universities still mainly rely on the government to run schools. School-running system is not flexible enough, and the market forces are not involved enough. Relying solely on government funding, it is difficult to meet the needs of Guangdong to build a double first-class university. The outline puts forward clear strategic positioning and development goals, such as building an international scientific and technological innovation center, building a modern industrial system with international competitiveness, etc. To promote the internationalization of higher education in the context of the new era, Guangdong Province must first respond to the strategic positioning and goals of the Hong Kong-Macao Greater Bay Area, clarifying the strategic goal of developing the internationalization of higher education in Guangdong in the context of the new era, further promoting the depth of multiparty cooperation, establishing and improving the multiparty cooperation mechanism, and actively promoting international scientific research cooperation, Sino-foreign cooperation in running schools, and other internationalization Educational activities to serve the

construction and development of the Guangdong-Hong Kong-Macao Greater Bay Area [23]. Secondly, Guangdong Province should try to create a school-running system that is dominated by the government, integrated into the market, and participated in by the society. The main body is diverse, the forms are diverse, and the school-running system is full of vigor and vitality.

- (4) Insufficient attention to international assessment and lack of quality assurance system

Quality assurance is an important aspect in the process of education internationalization. To promote the internationalization of higher education, there must be corresponding supporting management systems and operating mechanisms as guarantees, such as quality evaluation systems, so as to comprehensively promote the internationalization of higher education and provide international. The exchange and cooperation activities provide sufficient management support. In 2010, the Guangdong Provincial Department of Education launched the first pilot work of external evaluation of education internationalization in 8 colleges and universities in the province, which is an important attempt to establish and improve the quality assurance system of higher education internationalization in Guangdong. However, at present, Guangdong has not yet formed a set of higher education internationalization evaluation system and quality assurance system to guide and guarantee the development of higher education internationalization of various institutions of higher education. Some colleges and universities may unilaterally pursue a certain aspect of education internationalization in the process of developing higher education internationalization, such as blindly focusing on expanding Sino-foreign or overseas cooperation projects and ignoring other internationalization indicators, making the development of higher education internationalization not comprehensive and sufficient [24]. Some institutional documents, such as the Regulations of the People's Republic of China on Sino-Foreign Cooperative Education, though they have put forward access conditions and school-running procedures for Sino-foreign cooperative education, there may be unclear points in the implementation process and a lack of effective supervision mechanisms. Therefore, it is necessary to formulate a scientific and reasonable internationalization evaluation system to comprehensively evaluate the development of internationalization of higher education, find and solve problems in a timely manner, effectively promote the process of internationalization of higher education, ensure the quality of internationalization development, and connect the strategic needs of Guangdong-Hong Kong-Macao

Greater Bay Area. At the same time, it is necessary to establish an effective supervision mechanism to ensure that the internationalization of education develops better on a reasonable and legal path and to promote the internationalization of higher education in Guangdong to open up a new situation in the new era.

## 5. Conclusion

There are various types of higher education in the Guangdong-Hong Kong-Macao Greater Bay Area, each with its own characteristics and complementarity. Focusing on the positioning of higher education in the Guangdong-Hong Kong-Macao Greater Bay Area, the demand for higher education in the economic, technological, political, and cultural development of the Guangdong-Hong Kong-Macao Greater Bay Area is summarized from the three dimensions of talent cultivation, collaborative innovation, and cooperative development. The division of these three dimensions is not the existence of mutual separation, but the interconnected organic unity, which constitutes the realistic demands of the construction of the Guangdong-Hong Kong-Macao Greater Bay Area for higher education [20, 21].

## Data Availability

The dataset can be obtained from the corresponding author upon request.

## Conflicts of Interest

The author declares that there are no conflicts of interest.

## Acknowledgments

The authors thank Guangdong 2021 Education Science Planning Project (special project for Higher Education) Research on Adaptability of higher vocational education to labor market demand in Guangdong-Hong Kong-Macao Greater Bay Area (no. 2021GXJK609) and the 2022 General University Youth Innovation Talent Project in Guangdong Province, Research on the construction of the supply of technical talents in higher vocational education and the market demand matching model of the Guangdong-Hong Kong-Macao Greater Bay Area (no. 2022WQNCX137).

## References

- [1] L. Huan Yu, S. Ru, X. B. Zheng, and S. Chen, "Environmental Pollution; Study Findings from Guangdong University of Education Provide New Insights into Environmental Pollution (Brominated and Phosphate Flame Retardants from interior and Surface Dust of Personal Computers: Insights into Sources for Human Dermal)," *Computer Weekly News*, vol. 28, no. 9, pp. 1–10, 2021.
- [2] Mathematics - Algebra, "Study Findings from Guangdong University of Education Broaden Understanding of Algebra (On Sigma-Subnormal Subgroups of Factorised Finite Groups)," *Mathematics Week*, 2020.
- [3] Computers - Computer Simulation, "Researchers from Guangdong University of Education Describe Findings in Computer Simulation (Global Existence of Landau-Lifshitz-gilbert Equation and Self-Similar Blowup of Harmonic Map Heat Flow on S-2)," *Computer Weekly News*, 2020.
- [4] R. Zhou, K. Ullah, Q. Lin, and S. Yang, "Nanotechnology - Nanophotonics Guangdong University of Education Details Findings in Nanophotonics (Recent Advances in Graphene and Black Phosphorus Nonlinear Plasmonics)," *Nanotechnology Weekly*, vol. 9, no. 7, 2020.
- [5] "Mathematics - boundary value problems; findings on boundary value problems detailed by investigators at Guangdong university of education (renormalization for the laplacian and global well-possness of the landau-lifshitz-gilbert equation in dimensions  $N \geq 3$ )," *Journal of Mathematics*, 2020.
- [6] "Computation - symbolic computation; new symbolic computation data have been reported by researchers at Guangdong university of education (determining the limits of bivariate rational functions by sturm's theorem)," *Journal of Mathematics*, 2020.
- [7] Plasmonics, "Studies from Guangdong university of education describe new findings in plasmonics (lifetime of enhanced graphene surface plasmon and superstrate sensitivity)," *Journal of Physics Research*, 2020.
- [8] Optical Research, "Reports from Guangdong university of education provide new insights into optical research (controlling the plasmon-induced transparency system based on Dirac semimetal at mid-infrared band)," *Journal of Technology*, 2019.
- [9] Mathematics, "Data from Guangdong university of education provide new insights into mathematics (value distribution of differential-difference polynomials of meromorphic functions)," *Journal of Mathematics*, 2019.
- [10] Z. Cai, H. Zhu, and S. Duan, "Allelopathic interactions between the red-tide causative dinoflagellate proroentrum donghaiense and the diatom phaeodactylum tricornutum this study was supported by the natural science foundation of China-Guangdong province joint key project (U1133003) science technology planning project of Guangdong province (2012B020307009) open fund from key laboratory of aquatic eutrophication control of harmful algal blooms of Guangdong higher education institutes open fund from key laboratory of microbial resources," *Oceanologia*, vol. 56, no. 3, pp. 639–650, 2014.
- [11] J. Q. Jiang, "Vector meson masses in two-dimensional SU ( N c ) lattice gauge theory with massive quarks supported by natural science foundation of the education department of Guangdong province of China (06Z027) and professor foundation of Guangdong education Institute," *Chinese Physics C*, vol. 32, no. 1, 2008.
- [12] Z. Ma, Y. Niu, and Y. I. Dai, "The study of regional teacher training mode in the environment of Guangdong education cloud streaming," in *Proceedings of the 2016 International Forum on Management, Education and Information Technology Application*, IEEE, Dordrecht, The Netherlands, January 2016.
- [13] W. Lirao, "The cultivation and importance of playing and singing skills of children's songs in the context of "new teacher-training": Taking Guangdong University of Education as an Example," in *Proceedings of the 7th International Conference on Arts, Design and Contemporary Education (ICADCE 2021)*, IEEE, Dordrecht, The Netherlands, August 2021.

- [14] Me Education and A. H. Kong, "Education Institution Building the Path towards excellence," *M2 Presswire*, 2020.
- [15] C. C. Cheang, B. Y. Lee, B. H. Yeung Ip, and W. H. Yiu, "Biology - Marine Biology; Findings on Marine Biology Detailed by Researchers at Education University of Hong Kong (Fish and Crustacean Biodiversity in an Outer Maritime Estuary of the Pearl River Delta Revealed by Environmental DNA)," *Ecology Environment & Conservation*, vol. 161, no. 4, Article ID 111707, 2020.
- [16] Science - Social Science, "Investigators from Education University of Hong Kong Zero in on Social Science (The Selectivity of Musical Advantage: Musicians Exhibit Perceptual Advantage for Some but Not All Cantonese Tones)," *Science Letter*, 2020.
- [17] M. H. Chan and C. M. Lee, "Physics; Study Results from Education University of Hong Kong in the Area of Physics Reported (Constraining the Annihilating Dark Matter Mass by the Radio Continuum Spectral Data of the Ngc4214 Galaxy)," *Physics Week*, 2020.
- [18] C. Ho and M. Yuen, "Nonlinear Research; Findings from Education University of Hong Kong Provide New Insights into Nonlinear Research (Blowup for Projected 2-dimensional C-2 Solutions of Compressible Euler Equations with Coriolis Force)," *Journal of Technology & Science*, vol. 55, Article ID 103143, 2020.
- [19] T. W. Ling Lam, L. Fok, L. Lin, and Q. Xie, "Biology - Marine Biology; Research Conducted at Education University of Hong Kong Has Updated Our Knowledge about Marine Biology (Spatial Variation of Floatable Plastic Debris and Microplastics in the Pearl River Estuary, South China)," *Ecology Environment & Conservation*, vol. 158, Article ID 111383, 2020.
- [20] K. L. Cheung, "Science - Mathematics in Applied science; investigators at education university of Hong Kong describe findings in mathematics in applied science (global existence of the three-dimensional compressible euler equations for generalized chaplygin gas with damping)," *Journal of Mathematics*, 2020.
- [21] D. Y. Yeung and C. Y. H. Henry, "Conflict and Violence - Conflict Resolution; Study Data from Education University of Hong Kong Update Knowledge of Conflict Resolution (Conflict between Younger and Older Workers: An Identity-Based Approach)," *Politics & Government Week*, 2020.
- [22] "Mathematics - differential equations; reports on differential equations findings from education university of Hong Kong provide new insights (existence and uniqueness of low-energy weak solutions to the compressible 3D magnetohydrodynamics equations)," *Journal of Physics Research*, 2020.
- [23] "Machine Learning; Investigators at Education University of Hong Kong Report Findings in Machine Learning (Privacy-Preserving Shared Collaborative Web Services Qos Prediction)," *Journal of Robotics & Machine Learning*, 2020.
- [24] "Discrete and Continuous Dynamical Systems; Research Conducted at Education University of Hong Kong Has provided New Information about Discrete and Continuous Dynamical Systems (Existence and a Blow-Up Criterion of Solution to the 3D Compressible Navier-Stokes-Poisson Equations with)," *Journal of Technology & Science*, 2020.