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Improving Students' Satisfaction with the Quality of Innovation and Entrepreneurship Education in Colleges and Universities in the Guangdong-Hong Kong-Macao Greater Bay Area

Zelin Zhuo

ABSTRACT

Innovative and entrepreneurial talents are central to building an international innovation technology hub in the Guangdong-Hong Kong-Macao Greater Bay Area and higher education plays the main role in cultivating such talents. In a random sampling, a total of 5,021 valid questionnaires were obtained from 58 colleges and universities in the Guangdong-Hong Kong-Macao Greater Bay Area, including the "9 + 2" cities. The results show that the total satisfaction score of students' evaluation of innovation and entrepreneurship education in colleges and universities was 3.43, which is in the upper-middle level. Specifically, the implementation and popularization of innovation and entrepreneurship education in colleges and universities is satisfactory, and the corresponding curriculum system can be adjusted in accordance with the strategic development trends of the Greater Bay Area. However, there are some problems to be solved. First, it is still difficult to integrate effectively the regional innovative and entrepreneurial resources in the process of innovation and entrepreneurship education. Second, innovation and entrepreneurship education emphasizes theory using a single teaching method, and there is insufficient integration with professional education. In addition, there is a shortage of innovation and entrepreneurship platforms for practice, and the cooperation mechanisms between colleges and universities, society, and government need to be improved. Last, there is a serious shortage of teachers. In order to promote the development of innovation and entrepreneurship education, colleges and universities must establish a hierarchical system based on their own conditions, taking advantage of the innovative and entrepreneurial resources and industrial characteristics of the core cities in the Guangdong-Hong Kong-Macao Greater Bay Area. Moreover, it's necessary to develop excellent courses integrating professional education with innovation and entrepreneurship education, and improve the mechanisms of appointment and performance evaluation of instructors, to establish a good model of teachers and students innovating together.

KEYWORDS

Guangdong-Hong Kong-Macao Greater Bay Area; international innovation and technology hub; the quality of innovation and entrepreneurship education

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Research Question

The "Outline Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area," issued by the Central Committee of the Communist Party of China and the State Council on February 18, 2019, set out a uniquely important plan for the Guangdong-Hong Kong-Macao Greater Bay Area to build an international science and technology innovation hub. Innovation and entrepreneurship are key tasks for the promotion of the Guangdong-Hong Kong-Macao Greater Bay Area international science and technology innovation hub. In particular, high-tech innovation and entrepreneurship relying on the transformation of scientific and technological achievements should become the focus of industrial development in the Greater Bay Area. Universities in the Guangdong-Hong Kong-Macao Greater Bay Area should unswervingly implement the "innovation and entrepreneurship" strategy while fully considering the construction needs of the Greater Bay Area. They should create a strong atmosphere of innovation and entrepreneurship, and provide a wealth of human talent in the fields of innovation and entrepreneurship and support for entrepreneurial achievement, for the construction of an international science and technology innovation hub in the Guangdong-Hong Kong-Macao Greater Bay Area. As an important vehicle for the cultivation of innovative and entrepreneurial talents in colleges and universities, innovation and entrepreneurship education is mainly reflected in several ways. On the one hand, it promotes the development of entrepreneurial activities by improving the entrepreneurial skills and ability of innovative entrepreneurs. Innovation and entrepreneurship education can also help students to choose the type of entrepreneurship that suits them, so that they can directly obtain knowledge of entrepreneurship, thereby enhancing their willingness to start a business (Jones and Iredale 2006). On the other hand, innovation and entrepreneurship education further influences students' ideas about entrepreneurship by changing their attitudes, subjective norms, and perception and behavior toward it (Fiet 2001). When it comes to innovation and entrepreneurship education, the Guangdong-Hong Kong-Macao Greater Bay Area is a relative latecomer compared with other bay areas in the world. Only by having a better understanding of the innovation and entrepreneurship situation and needs of the Guangdong-Hong Kong-Macao Greater Bay Area can we make targeted recommendations for innovation and entrepreneurship education, so as to cultivate more innovative and entrepreneurial talents for the area and to assist it in becoming a world-renowned international science and technology innovation hub sooner.

Literature Review

The Importance and Challenges of Innovation and Entrepreneurship Education in the Guangdong-Hong Kong-Macao Greater Bay Area

Different from past economic and trade cooperation between Guangdong, Hong Kong and Macao, the construction of the Guangdong-Hong Kong-Macao Greater Bay Area is characterized by innovation-driven development of the Bay Area economy and the creation of world-class city clusters. Innovation is also the driving force behind the economic development of the San Francisco Bay Area, the New York Bay Area and the

Tokyo Bay Area. The cluster of high-level universities in the San Francisco Bay Area led by Stanford University supply innovative and technical talents to Silicon Valley. The New York Bay Area has a cluster of Ivy League schools to provide strong intellectual backing for its economic development, while the Tokyo Bay Area launched the Top Global University Project to attract international comprehensive talents (Ou 2018). From the development experiences of these world-class bay areas, it can be seen that scientific research and technology and innovative and entrepreneurial talents are undoubtedly the engine of economic innovation and development in bay areas, and the source of talent is world-class institutions of higher learning. At the same time, the Pearl River Delta region is in a stage of industrial transformation and upgrading, and the demand for innovative talents with entrepreneurial ability is increasing (Gu, Chao, and Yang 2018). Therefore, in order to develop the innovation economy of the Guangdong-Hong Kong-Macao Greater Bay Area and to turn it into an international science and technology innovation hub, it is absolutely necessary to build a high-level university cluster in line with international standards, innovating its universities, especially their innovation and entrepreneurship education system, and cultivating technical and innovative and entrepreneurial talents.

The current development of innovation and entrepreneurship education in the cities of the Guangdong-Hong Kong-Macao Greater Bay Area is still "individual." Most of the exchanges and cooperation between universities are spontaneous. The breadth and depth of cooperation are limited by regional gaps and differences in systems and mechanisms. There is a lack of common strategic goals and development direction. The development of higher education in mainland universities in the Guangdong-Hong Kong-Macao Greater Bay Area is uneven, and their innovation and entrepreneurship education system remains "elitist" and "fragmented." That is, problems include: innovation and entrepreneurship education does not really target all students, entrepreneurial projects and knowledge systems are separate, innovation and entrepreneurship resources inside and outside the school are disconnected, and the innovation and entrepreneurship education system is incomplete (Zhang 2014). Although the universities in Hong Kong and Macao have internationally leading education systems, the shortage of innovative talents and the poor environment for innovation and entrepreneurship mean that entrepreneurs face high costs to transform innovation and entrepreneurship achievements (Ni 2018). The proposal of the development strategy of the Guangdong-Hong Kong-Macao Greater Bay Area provides just the opportunity for universities in the Bay Area to coordinate the development of innovation and entrepreneurship education and share innovation and entrepreneurship resources.

The Effect of College Students' Satisfaction on Improving the Quality of Education

As one of the main stakeholders in higher education, students have a critical say and their satisfaction is important. Student feedback helps higher education institutions to reflect on their problems and make changes to adapt to the development of the times. For example, in the San Francisco Bay Area, universities try to respond to the demands of Silicon Valley, often introducing entirely new courses that are usually related to new types of hardware and software technologies (Zhuo 2019a). Research on student

satisfaction in higher education in developed western countries began earlier. In 1994, the United States launched a student satisfaction survey in colleges and universities across the country (Han 2006). In 1999, Martensen et al. constructed a structural equation model for customer satisfaction in colleges and universities based on the European customer satisfaction model, believing that evaluating student satisfaction is a fundamental requirement for continuous improvement of teaching in colleges and universities (Martensen et al. 2000). Gremler et al. designed a student satisfaction evaluation model in 2002 to study students' satisfaction with teachers' teaching outcomes (Gremler and McCollough 2002). Researchers in China have also begun to pay attention to student satisfaction in recent years. Sun Youran and others have conducted empirical research to construct and test a structural model for practical teaching satisfaction in colleges and universities, providing suggestions for colleges to improve practical teaching satisfaction (Sun, Yang, and Jiang 2016). Li Yuqian established a higher education student satisfaction index model from six structural variables, including: student satisfaction, talent training, perception management, campus culture, perceived quality, and hardware support (Li 2017). All these studies show that students' satisfaction with higher education plays an important role in improving the quality of higher education. With the continuous progress in constructing the Guangdong-Hong Kong-Macao Greater Bay Area, demand for innovative and entrepreneurial talents will continue to rise. At present, the cultivation of innovative and entrepreneurial talents at universities in the Greater Bay Area is far from meeting the needs and goals of regional construction. According to the latest "Guangdong-Hong Kong-Macao Greater Bay Area Talent Development Report," the proportion of the area's overall population with higher education is only 17.47% of the permanent resident population. Hong Kong ranks first in the Greater Bay Area with a proportion of 26.18%, but it is still far lower than the San Francisco Bay Area, where 50% of the permanent resident population has obtained higher education (Duan 2020). This requires colleges and universities in the Guangdong-Hong Kong-Macao Greater Bay Area to increase their efforts in talent training and improve the efficiency of talent training in innovation and entrepreneurship education in order to meet the needs of the development of the Bay Area.

Research Design

Theoretical Basis of the Study

In the context of developing the Guangdong-Hong Kong-Macao Greater Bay Area, the increasing demand for innovative and entrepreneurial talents and the updating of relevant policy support bring both opportunities and challenges for the construction of innovation and entrepreneurship education systems in colleges and universities. Although there has been some work done on levels of satisfaction with innovation and entrepreneurship education, most researchers usually start their analysis with the curriculum, teaching staff, education model, supporting mechanisms, etc. Among these, evaluation of the curriculum design includes teaching modes, number of courses, and types of course. The evaluation of teaching staff includes the number of teachers, skills taught, guidance offered, etc. The education model concerns the evaluation of how colleges and universities combine entrepreneurship courses, entrepreneurial practice, and

entrepreneur competitions in their innovation and entrepreneurship education. Supporting mechanisms include funding support, incubation mechanisms, and policy guarantee mechanisms (Li, Li, and Du 2013). In 2015, the Central Committee of the Communist Party of China and the State Council promulgated the "Implementation Suggestions for Deepening the Reform of Innovation and Entrepreneurship Education in Colleges and Universities." It clearly stated that by 2020, it is necessary to establish and improve an innovation and entrepreneurship education system in colleges and universities that integrates classroom teaching, independent learning, combined practice, guidance and assistance, and cultural leadership, in order to improve the quality of innovative and entrepreneurial talents training, enhance students' awareness and ability in innovation and entrepreneurship, and encourage more students to devote themselves to entrepreneurial practice (Zhuo 2019b). Therefore, in order to better understand the development status of innovation and entrepreneurship education in colleges and universities in the Guangdong-Hong Kong-Macao Greater Bay Area, this study will combine the current research results with the overall goal of establishing and improving the innovation and entrepreneurship education system in colleges and universities in China. By evaluating college students' satisfaction with their innovation and entrepreneurship education in terms of five factors—course quality, competition experience, provisions for practice, policy support and teacher guidance—this study analyzes the development status of innovation and entrepreneurship education in universities in the Guangdong-Hong Kong-Macao Greater Bay Area, and thereby identifies and clarifies the existing development problems.

Course quality evaluation concerns course types, teaching methods, teaching skills, and the relevance of course content to cutting-edge trends. It is an indicator for measuring teaching quality, the cutting-edge nature of content, and the relevance between course content and majors (Huang and Wang 2013). Competition experience evaluation assesses whether innovation and entrepreneurship competitions improve the entrepreneurial ability, entrepreneurial self-confidence, interpersonal network expansion, and teamwork ability of college students. It is an indicator for measuring whether competition experience really improves students' entrepreneurial ability. The evaluation of the provisions for practice determines whether the innovation and entrepreneurship practice of colleges and universities is sufficiently complete in terms of funding support, service integration, and the construction of science and technology entrepreneurship parks and practice bases. It is an indicator for assessing the provision and improvement of innovation and entrepreneurship practice platforms in universities. The evaluation of policy support is a measure of whether the innovation and entrepreneurship policies of colleges and universities are sufficiently supportive and up-to-date in terms of tax relief, interest-free loans, free training, and simplification of the process of registering college students at enterprises. Teacher guidance evaluation determines whether teacher guidance is helpful to the application and learning of professional knowledge, the understanding of advances in subject knowledge, the improvement of scientific research ability, innovative and entrepreneurial ability, and the implementation of entrepreneurial projects. It is an indicator for measuring improvement in students' innovation and entrepreneurship abilities under the guidance of teachers.

Selection of Survey Subjects

In this study, random sampling was used to conduct a questionnaire survey on students from a total of 58 colleges and universities in the "9 + 2" cities of the Guangdong-Hong Kong-Macao Greater Bay Area. There were: 29 undergraduate colleges including Sun Yat-sen University, South China University of Technology, South China Normal University, and Guangdong Medical University; 24 technical colleges including Shenzhen Polytechnic, Guangdong Engineering Polytechnic, Guangzhou Panyu Polytechnic; and Hong Kong and Macao universities, including the Chinese University of Hong Kong, Hong Kong University of Science and Technology, and University of Macao. A total of 5,525 questionnaires were returned. 504 invalid questionnaires were excluded owing to their answers being too long or too short, filling in invalid school names, etc., This left 5,021 valid questionnaires, that is a questionnaire effectiveness rate of 90.87%. The selection of the samples for this questionnaire survey conforms to the requirements of random sampling in terms of type of school, students' year of study and major, and the structure of the returned questionnaire was reasonable. The specific data are shown in Table 1.

Questionnaire Design

This research is based on nearly 20 years of innovation and entrepreneurship education practice and theory. It makes use of a literature review and sorts out and draws on existing questionnaires related to the evaluation of innovation and entrepreneurship education to formulate a preliminary questionnaire (Huang and Huang 2019). Before conducting the formal survey, this study randomly selected 98 colleges and universities across the country to test the students who had received innovation and entrepreneurship education in their schools. After many discussions and revisions based on their feedback, a formal questionnaire was finally formed. The formal questionnaire is divided into 3 parts. The first part has 10 questions regarding the students' gender, year of study, major, the type of higher education institution where they study, the location of the higher education institution and its name, etc. The second part has 18 questions concerning students' evaluation of the innovation and entrepreneurship education at their school covering five aspects: entrepreneurship courses, entrepreneurship teachers, entrepreneurship competitions, entrepreneurship practices, entrepreneurship policies. It adopts the 5-point Likert scoring method, asking students to give 1-5 points from "completely disagree" to "completely agree." The third part mainly investigates the current situation of innovation and entrepreneurship education at universities in the Guangdong-Hong Kong-Macao Greater Bay Area, addressing the aspects of teaching methods, assessment methods, and school-level policy support. It has a total of 11 questions.

Questionnaire Reliability and Validity

After the formal questionnaire for this study was collected, SPSS 21.0 and Amos software were used to organize and analyze the data. The questionnaire divides the evaluation of innovation and entrepreneurship education at Guangdong-Hong Kong-Macao

Table 1. Colleges and universities in the Greater Bay area.

Item		Frequency	%
Gender	Male	1888	37.6
	Female	3133	62.4
Type of institution	College/university	4064	80.9
	Technical college	957	19.1
Name of institution (only institutions presenting over 1% of results are listed due to space)	Huizhou University	1747	34.4
	Guangzhou College of Technology and Business	494	9.7
	Xinhua College of Sun Yat-sen University	445	8.8
	Guangdong Medical University	391	7.7
	South China Normal University	303	6.0
	Guangzhou Health Science College	241	4.7
	Guangzhou City Polytechnic	238	4.7
	Shenzhen Polytechnic	178	3.5
	Guangzhou Institute of Technology	139	2.7
	Guangdong University of Education	124	2.4
	Guangzhou Nanfang College	116	2.3
	Sun Yat-sen University	111	2.2
	Guangdong Huizhou Health School	105	2.1
	South China Agricultural University	96	2.0
	Wuyi University	69	1.4
	Guangzhou City University of Technology	46	1.0
	Guangdong Nanfang Institute of Technology	44	1.0
	University of Macao	36	1.0
	South China University of Technology	30	1.0
	Hong Kong University of Science and Technology	18	1.0
	Chinese University of Hong Kong	16	1.0
Year of study	Second year	2705	53.8
	Third year	1907	38.0
	Fourth year	370	7.4
	Fifth year	39	0.8
Major	Liberal arts	414	8.4
	Economics, management	2003	40.6
	Science, engineering	1596	32.4
	Other	920	18.6
Entrepreneur practice	Yes	785	15.6
	No	4236	84.4
Entrepreneur willingness	Yes	547	10.9
	No	4474	89.1
Total		5021	100

Greater Bay Area universities into five dimensions: entrepreneurship courses, entrepreneurship competitions, entrepreneurship practices, entrepreneurship policies, and entrepreneurship teachers. The internal consistency reliability coefficient of the evaluation scale is 0.961. Among them, the internal consistency reliability coefficients of the five dimensions of entrepreneurship courses, entrepreneurship competitions, entrepreneurship practices, entrepreneurship policies, and entrepreneurship teachers are 0.864, 0.907, 0.929, 0.929, and 0.961 respectively. Therefore, the reliability of the scale is good.

On this basis, a validity analysis of the scale was conducted and the results showed that the KMO value was 0.959, which was greater than 0.8, allowing a further factor analysis to be done. The chi-square statistic is significant at 0.000, i.e. less than 0.01. The degree of freedom is 153, and the approximate chi-square value of the Bartlett sphere test is 90908.447, which means that the scale data has good validity and has reached the validity standard for factor analysis. From the original data of 5,021 samples, 6% of the cases were randomly selected, about 306 data sets, and the confirmatory factor analysis of the scale was carried out using Amos 7.0. The fit index showed that $\chi^2 = 268.908$, d $f = 125$, $\chi 2/\mathrm{df} = 2.151$, the result is lower

Table 2. Descriptive analysis of the evaluation of innovation and entrepreneurship education in colleges and universities in the Greater Bay Area ($N = 5021$).

	Mean	Standard deviation
Course quality	3.24	0.79
Competition experience	3.52	0.76
Provisions for practice	3.28	0.80
Policy support	3.43	0.79
Teacher guidance	3.67	0.74
Overall	3.43	0.66

than 3, the model fit well; GFI = 0.912, NFI = 0.951, TLI = 0.967, CFI = 0.973, the results are all higher than 0.8, the model fit well; RMSEA = 0.061, the result is lower than 0.08, in line with the model fitting criteria, the scale has good structural validity.

Students' Satisfaction Toward Innovation and Entrepreneurship Education at Colleges and Universities in the Guangdong-Hong Kong-Macao Greater Bay Area

General Analysis of the Current Situation of Innovation and Entrepreneurship Education in Colleges and Universities in the Guangdong-Hong Kong-Macao Greater Bay Area

The survey shows that universities in the Guangdong-Hong Kong-Macao Greater Bay Area have basically all opened innovation and entrepreneurship courses, and the overall score in satisfaction evaluations is in the upper-middle levels (the overall average score is 3.43, out of a total score of 5 points). The average score for competition experience and teacher guidance is higher (3.52 and 3.67, respectively), the average score for policy support is in the upper-middle level (3.43), while the average score for course quality and provisions for practice is low (3.24 and 3.28, respectively) (Table 2).

Policy Support for Innovation and Entrepreneurship Continues to Increase, but Innovation and Entrepreneurship Courses and Teaching Methods Are in Urgent Need of Reform

With the gradual advancement of the Guangdong-Hong Kong-Macao Greater Bay Area strategy, the national government and the local governments of Guangdong, Hong Kong and Macao continue to increase policy support for innovation and entrepreneurship among college students in the Guangdong-Hong Kong-Macao Greater Bay Area. The data show that since 2016 the governments of Guangdong, Hong Kong and Macao have issued a total of 129 policy documents related to innovation and entrepreneurship. The majority of these are related to industrial policy support (16 documents, or 23.19%), technological support capability enhancement (12 or 17.39%), construction and financial support to establishing innovation and entrepreneurship development highlands (10 or 14.49%) and service platforms (8 or 11.59%), respectively (Xia 2019). It can also be seen from the analysis of the survey data that the overall average score of

Table 3. Descriptive analysis of the quality evaluation of innovation and entrepreneurship courses in colleges and universities in the Greater Bay Area ($N = 5021$).

Item	Mean	Standard deviation
Diversity of course offerings	3.102	0.9041
Diversity of teaching methods	3.172	0.8923
Entrepreneurial experience of teachers	3.191	0.9075
Extensive teaching experience of instructors in entrepreneurship education	3.244	0.9021
Integration of course content with student's own profession	3.074	0.9163
Relevance of course content to cutting-edge trends	3.304	0.8804
Overall satisfaction with entrepreneurship courses	3.181	0.7686

college students' satisfaction with the support policies for innovation and entrepreneurship is 3.43, which is at an upper-middle level.

Most Colleges and Universities in the Guangdong-Hong Kong-Macao Greater Bay Area Have Set Up Courses on Innovation and Entrepreneurship, but the Teaching Format Mainly Consists of Classroom Lectures, Which Are Not Practical Enough

Although there is increasing policy support for innovation and entrepreneurship in the Guangdong-Hong Kong-Macao Greater Bay Area, the design of the curriculum for innovation and entrepreneurship education in colleges and universities lags behind demand, and it is difficult to respond to the needs of the policy environment. This has led to a situation where it is difficult for universities seeking to cultivate innovative and entrepreneurial talents and governments issuing innovation and entrepreneurship policies in the Greater Bay Area to sufficiently support and promote each other. All of this is reflected in the average score of college students' satisfaction in course quality: it is the lowest among the five aspects evaluated. Specific problems with the innovation and entrepreneurship education offered by universities in the Guangdong-Hong Kong-Macao Greater Bay Area include: their course offerings lack diversity, their teachers rely on a single teaching method, the main lecturers for innovation and entrepreneurship courses lack entrepreneurial experience, there is little integration between entrepreneurial courses and the profession (Table 3).

Specifically, most colleges and universities in the Guangdong-Hong Kong-Macao Greater Bay Area now offer courses on innovation and entrepreneurship, with the majority offering 1-2 courses, but more than 40% of the students still indicated that they had not taken a course in "Basics of Entrepreneurship." Take South China Normal University, a high-level university in the Guangdong-Hong Kong-Macao Greater Bay Area, as an example. South China Normal University is not only noted for its teacher education, but is also a leader in the field of innovation and entrepreneurship education in the Guangdong-Hong Kong-Macao Greater Bay Area. The university has offered innovation and entrepreneurship education for more than 10 years, establishing the first entrepreneurship institute in Guangdong Province in May 2009. It gradually formed an innovation and entrepreneurship education ecosystem that "turned innovation into a discipline, integrated entrepreneurship, systemized policies, changed services for society, and marketized values." In the 2017 version of its training plan, the university's elective courses open to all undergraduate students were divided into 7 modules, including the unique "innovation and entrepreneurship" module. Following the release of the "Outline Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area"

in 2019, the school started to add innovation and entrepreneurship courses to implement the plan's requirements, and is committed to cultivating high-quality innovative and entrepreneurial talents in the New Era. According to the schedule for general elective courses for the first semester of 2020–2021 published on the school's official website, there are 182 general elective face-to-face courses in the school, including 17 courses in innovation and entrepreneurship modules, accounting for 9.34% of the total, which is 4 courses more than in the previous semester. The entire innovation and entrepreneurship module courses are divided into three categories: general public elective courses, general education training courses, and general education courses. There are 17 general public elective courses, including "Business Models and Entrepreneurship Practice," "Labor Law," "Entrepreneurship, Inheritance, and Control in Chinese Family Businesses," etc. The four general education training courses include "Innovative Thinking Training," "Introduction to Critical Thinking," etc.; The two general education courses are "Design Thinking" and "Innovation Thinking and Method Training." These 17 courses mainly take the form of classroom lectures and case studies. This is in line with our research results which show that 64.4% of students surveyed believe that innovation and entrepreneurship courses are mainly based on classroom lectures and case studies.

In the survey, 31.6% of the students believed that entrepreneurship practice simulation should be the most important teaching format in innovation and entrepreneurship courses, and more than 67% of the students believed that entrepreneurship competitions and practice in entrepreneurship parks would be more conducive to the formation and realization of entrepreneurial projects. It can be seen that students are more inclined to accept innovative and entrepreneurial practice courses and corresponding teaching methods. Although the original intention of setting up innovation and entrepreneurship education in colleges and universities is not the same as encouraging students to throw themselves into the competitive ranks of entrepreneurs, and entrepreneurial practice is not equivalent to simulating entrepreneurship, practice is an important component and main feature of innovation and entrepreneurship education and cannot be omitted. In other words, in order to cultivate students from universities in the Guangdong-Hong Kong-Macao Greater Bay Area to develop innovative and entrepreneurial talents, practice should not be an extracurricular activity, but a compulsory part of the course of study, whether it means participating in entrepreneurship competitions, operating simulated enterprises, or participating in business incubation (Shi 2018).

Universities in the Guangdong-Hong Kong-Macao Greater Bay Area Use a Rich Range of Competitions to Advance Students' Innovation and Entrepreneurship Training

The overall satisfaction of college students in the Guangdong-Hong Kong-Macao Greater Bay Area with entrepreneurship competitions has a score of 3.42, putting it at an upper-middle level. Students believe that participating in entrepreneurship competitions can not only improve their entrepreneurial ability, teamwork skills, and entrepreneurial self-confidence, but also expand their personal networks and establish good teamwork and collaboration skills for implementing entrepreneurial projects in the future (Table 4).

Table 4. Descriptive analysis of the experience of innovation and entrepreneurship competitions in colleges and universities in the Greater Bay Area.

Item	*N*	Minimum	Maximum	Mean	Standard deviation
Diversity of competitions	5021	1.0	5.0	3.389	0.8563
Ease in implementing competition projects	5021	1.0	5.0	3.149	0.8538
Integration of competition projects with one's profession	5021	1.0	5.0	3.212	0.8671
Competition improves entrepreneurial ability	5021	1.0	5.0	3.454	0.8417
Competition improves entrepreneurial self-confidence	5021	1.0	5.0	3.479	0.8339
Competition expands personal networks	5021	1.0	5.0	3.573	0.8284
Competition improves teamwork and collaboration skills	5021	1.0	5.0	3.679	0.8097
Competition greatly assists real entrepreneurship	5021	1.0	5.0	3.504	0.8291
Overall satisfaction with entrepreneurship competitions	5021	1.0	5.0	3.4298	0.71024

Entrepreneurship competition offers a platform for college students to train and showcase themselves. It provides a "training ground" for college students to become innovators and entrepreneurs and, to a certain extent, it can be regarded as an important way to demonstrate the effectiveness of innovation and entrepreneurship education in colleges and universities. Compared with universities in other regions in the mainland, the Guangdong-Hong Kong-Macao Greater Bay Area combines the infrastructure of an international science and technology innovation hub and the integration mechanisms of innovation and entrepreneurship promoted by the key cities of Guangzhou, Shenzhen, Hong Kong, and Macao. It has a good environment for innovation and entrepreneurship and abundant resources for entrepreneurship competition. In addition to national entrepreneurship competitions, universities in the Guangdong-Hong Kong-Macao Greater Bay Area also actively hold regional competitions to promote the development of innovation and entrepreneurship education. For example, Shenzhen University hosted the first national college student public welfare innovation and entrepreneurship special event, the "Guangdong-Hong Kong-Macao Greater Bay Area College Students' Public Welfare Innovation and Entrepreneurship Project Competition"; Guangzhou City held the "Guangdong-Hong Kong-Macao Greater Bay Area College Students' Entrepreneurship Competition," Jinan University held the "Zhuhai-Macao College Students' Innovation and Entrepreneurship Competition," Shenzhen Qianhai Entrepreneurs' Park held the Qianhai Guangdong-Hong Kong-Macao-Taiwan Young Persons' Youth Innovation and Entrepreneurship Competition. These events attracted more than 1,000 participants from 14 colleges and universities in Guangdong, Hong Kong and Macao. Diversified entrepreneurship competitions not only provide a platform for collaborative development and win-win cooperation in the Guangdong-Hong Kong-Macao Greater Bay Area, but also help to promote innovation and entrepreneurship training for students.

Satisfaction toward College Teachers' Guidance is Fairly High, and There is Clear Cooperation between Teachers and Students in Hong Kong and Macao Colleges and Universities

Of the five areas evaluated, teacher evaluation has the highest average score of 3.67 points, indicating that students have a high overall satisfaction with innovation and entrepreneurship teachers. However, when analyzing the influence that teachers can have on students' entrepreneurial projects, only 15% of students believe that teachers

provide the most help in improving their innovation and entrepreneurial skills and cultivating a spirit of innovation. After further analysis, it was found that the reason why students believe that teachers only play a limited role in the process of innovation and entrepreneurship is closely related to students' definition of the teacher's role. For example, 69.9% of students believe that teachers are mainly facilitators rather than collaborators in entrepreneur teams. After investigating the pattern of cooperation between teachers and students in entrepreneur teams, it was found that cases where the teacher provided guidance and students were the entrepreneurs accounted for 61.7%, whereas teams where teachers and students jointly developed and managed accounted for 21%. From these data, it is not difficult to see that teachers more often play the role of facilitator in the process of innovation and entrepreneurship, mainly helping students by pointing them in the right direction, rather than collaborating with them. But in fact, in the work of innovation and entrepreneurship, the scientific research and technical support of the teacher as collaborator is very important.

Upon examining the discrepancies in the data, it was further found that compared with the mainland universities, there is a significant difference in the students' satisfaction with teachers at Hong Kong and Macao universities ($p < 0.01$). The satisfaction of Hong Kong and Macao university students was noticeably higher than their mainland counterparts, scoring 3.49 and 3.22, respectively. From the follow-up data analysis, we also see that in terms of teacher cooperation, students at Hong Kong and Macao colleges and universities more often regard their teachers as collaborators, and interact with them more frequently. This may be related to the fact that the majority of teachers at Hong Kong and Macao colleges and universities have experience of studying overseas and teacher-student relationship models abroad. Teachers in Hong Kong and Macao universities have strong scientific research and innovation strength. Teachers and students are "co-learners" in the process of academic research and participate together in the production and creation of knowledge. Both parties attach importance to equality and interactions and emphasize cooperation. They practice a student-oriented teaching model in the course of innovation and entrepreneurship collaboration with students, mainly adopting an approach of joint research, development, and operation between teachers and students. At the same time they focus on interactive dialogue with students, respecting the unique potential of individuals, and providing students with space for equal and free collaboration.

Analysis of Differences in the Evaluation of Innovation and Entrepreneurship Education at Colleges and Universities of Different Levels

Independent sample T-tests on the evaluation of innovation and entrepreneurship education at different levels of colleges and universities in the Guangdong-Hong Kong-Macao Greater Bay Area showed that the average score of students in technical colleges (*zhuanke yuanxiao*) on innovation and entrepreneurship education in each dimension was higher than that of undergraduates at universities (*benke yuanxiao*) ($p < 0.05$) (Table 5).

Combined with other survey data, it was found that the proportion of undergraduate colleges and universities in the Guangdong-Hong Kong-Macao Greater Bay Area that

Table 5. Analysis of differences in the evaluation of innovation and entrepreneurship education among colleges and universities of different levels in the Greater Bay Area.

	Different levels of institution		
	Undergraduate college/university	Technical college	t
Course quality	3.19 ± 0.79	3.46 ± 0.77	−9.944**
Competition experience	3.49 ± 0.75	3.66 ± 0.79	−6.438**
Provisions for practice	3.26 ± 0.79	3.37 ± 0.84	−3.734**
Policy support	3.41 ± 0.78	3.50 ± 0.83	−2.929**
Teacher guidance	3.65 ± 0.74	3.72 ± 0.74	−2.583*
Overall	3.40 ± 0.65	3.54 ± 0.69	−5.876**

Note: * The significance level for the mean difference was 0.05; **the significance level for the mean difference was 0.01

have already established entrepreneurship parks for college students accounts for 36.2%, which is significantly higher than that of technical colleges accounting for only 31.5%. At the same time, 78.7% of undergraduate colleges and universities have set up innovation and entrepreneurship courses, obviously higher than the 67.9% of technical colleges. It can be seen that a higher proportion of undergraduate colleges have established entrepreneurship parks and offer innovation and entrepreneurship courses than do technical colleges. Therefore, undergraduate colleges may be considered to be making faster progress in innovation and entrepreneurship than technical colleges, but the satisfaction of undergraduate university students, as seen in their feedback, is lower than that of students at technical colleges. The reason may be that undergraduate colleges are highly comprehensive and academic, and emphasize theoretical research. The innovation and entrepreneurship courses that they offer are also more theoretical and less practical. Students are more inclined to take innovation and entrepreneurship courses as elective courses, or postgraduate study may be their goal so they are less willing to face employment or entrepreneurship, and their attitude toward innovation and entrepreneurship education is accordingly quite negative. Technical colleges and higher vocational colleges pay more attention to training students' professional skills and entrepreneurial employment practice. Students have a greater appreciation for the school's entrepreneurial environment, and thus show a higher satisfaction rate with the school's innovation and entrepreneurship education.

Analysis of Differences in the Evaluation of Innovation and Entrepreneurship Education by Students of Different Majors

Upon carrying out a chi-square test on the willingness of college students in the Guangdong-Hong Kong-Macao Greater Bay Area to work in innovation and entrepreneurship after graduation, it can be seen that there are significant differences among students of different majors ($p < 0.05$). The proportion of students majoring in economics, management, science and engineering who wish to start their own business is 1–2 percentage points higher than the average, while the percentage of students majoring in liberal arts who wish to start their own business is 2.5 percentage points below the average. That a relatively low proportion of liberal arts students wish to start their own business may be because in the process of teaching them, colleges and universities often place their future career paths in such sectors as the civil service, banking, and foreign enterprises. Therefore, they pay more

attention to the actual employment situation of these students and often use their employment rate as an important indicator for assessment, while their understanding and action toward entrepreneurship education are insufficient (Wen 2015).

In addition, using one-way ANOVA, it can be seen that there are significant differences in the evaluation of innovation and entrepreneurship education by students of different majors ($p < 0.05$). After multiple comparisons (LSD), it may be concluded that students of different majors have significant differences in their satisfaction with innovation and entrepreneurship education at their college regarding entrepreneurship courses, entrepreneur competitions, entrepreneur practice, and entrepreneurship teachers, while there are no significant differences regarding their satisfaction toward policy support.

Table 6 details the differences in the satisfaction with innovation and entrepreneurship education between liberal arts students and students in science and engineering, economics and management in the Guangdong-Hong Kong-Macao Greater Bay Area. In terms of course quality and teacher guidance, liberal arts students are more satisfied with innovation and entrepreneurship courses than science and engineering and economics and management students. As for existing innovation and entrepreneurship course offerings at universities in the Guangdong-Hong Kong-Macao Greater Bay Area, they are mainly based on traditional classroom lectures, and there is a relative lack of opportunities for innovation and entrepreneurship practice. Compared with economics, management and science and engineering students who need more practical opportunities, liberal arts students are more accepting of traditional style courses and so perform better in them and are also more satisfied with them. In terms of teacher guidance, there is currently a shortage of teachers for innovation and entrepreneurship in colleges and universities. Compared with liberal arts students, science and engineering and economics and management students are more demanding of teacher guidance in the process of innovation and entrepreneurship practice, requiring teachers to invest more energy and time. The shortage of teachers has led to the low satisfaction of students majoring in these subjects.

In terms of competition experience and provisions for practice, students majoring in liberal arts are significantly less satisfied than students majoring in science and engineering and economics and management. This is closely related to the fact that, due to the limitations of their professional knowledge, liberal arts students find it difficult to convert their professional strengths into innovation and entrepreneurship capital that would help them in such competitions. In contrast, science and engineering students and economics and management students are better able to turn the professional knowledge they have acquired into innovation and entrepreneurship resources, leading to their higher satisfaction evaluation. As for provisions for practice, similar to competition experience, students majoring in science and engineering and economics and management are also more satisfied than liberal arts students. The survey data show that students of different majors believe that practice can improve their innovation and entrepreneurship ability the most. However, current innovation and entrepreneurship practice opportunities and platforms in colleges and universities are still relatively basic, and it is difficult to provide students with more resources and platforms.

Table 6. Differences in the satisfaction with innovation and entrepreneurship education among students of different majors in the Guangdong-Hong Kong-Macao Greater Bay Area.

	Different majors					
Evaluation	Liberal arts	Economics/Management	Science/Engineering	Other	*F*	LSD results
Course quality	3.26 ± 0.78	3.20 ± 0.77	3.21 ± 0.82	3.36 ± 0.77	9.682**	Lib. arts, Other > Sci./Eng., Econ./Mgmt.
Competition experience	3.44 ± 0.75	3.51 ± 0.76	3.47 ± 0.77	3.59 ± 0.76	5.053**	Other, Sci./Eng., Econ./Mgmt. >Lib. Arts
Provisions for practice	3.20 ± 0.76	3.33 ± 0.79	3.32 ± 0.81	3.33 ± 0.79	5.526**	Other, Sci./Eng., Econ./Mgmt. >Lib. Arts
Policy support	3.41 ± 0.78	3.41 ± 0.79	3.44 ± 0.81	3.46 ± 0.78	0.974	Nothing significant
Teacher guidance	3.68 ± 0.73	3.67 ± 0.73	3.62 ± 0.78	3.73 ± 0.72	3.942**	Other, Lib. arts, >Sci./Eng., Econ./Mgmt.

Note: **The significance level for the mean difference was 0.01.

Conclusion and Discussion

Rely on the Innovation and Entrepreneurship Resources and Industrial Characteristics of Core Cities in the Guangdong-Hong Kong-Macao Greater Bay Area to Establish a Hierarchical and Classified Innovation and Entrepreneurship Education System

According to Burton Clark's triangle of coordination model, the development of innovation and entrepreneurship education in colleges and universities will ultimately be led by the integration of forces from the government, the market and academia (Chen and Chen 2019). Therefore, promoting the innovation and entrepreneurship of college students in the Guangdong-Hong Kong-Macao Greater Bay Area requires colleges and universities, society and the government to work together and coordinate to give full play to their own strengths. However, from the perspective of the innovation and entrepreneurship curriculum in colleges and universities in the Guangdong-Hong Kong-Macao Greater Bay Area, the current types of innovation and entrepreneurship courses are highly homogenous, and it is difficult to distinguish between the innovation and entrepreneurship courses of colleges and universities of different levels and for different majors. This makes it difficult to effectively satisfy students' innovation and entrepreneurship needs. Therefore, it is not only necessary to enrich the types of innovation and entrepreneurship courses to meet the needs of students from different majors, but also to serve the overall development goals of creating an international science and technology innovation hub and a cluster of global cities proposed in the strategic plan for the Guangdong-Hong Kong-Macao Greater Bay Area, thereby effectively integrating the promotion of entrepreneurial talent training and regional development.

Specifically, innovative and entrepreneurial talent training in universities in the Guangdong-Hong Kong-Macao Greater Bay Area should be closely tied to the actual development of the Bay Area. It should not only meet the overall needs of social innovation and development in the Guangdong-Hong Kong-Macao Greater Bay Area, but also optimize its internal structure, such as the scale of entrepreneurship for different majors, the scale of entrepreneurship in different fields, and even the structure of innovation and entrepreneurship education system should tie in with the industrial characteristics of the Guangdong-Hong Kong-Macao Greater Bay Area and rely on the innovation and entrepreneurship resources of core cities. For example: rely on the financial technology, electronic information, cultural businesses and tourism and leisure industries in the four core cities of Hong Kong, Macau, Guangzhou, and Shenzhen in the Greater Bay Area; seize the important opportunities provided by the construction of the "Guangzhou-Shenzhen-Hong Kong-Macao" technology innovation corridor; fully absorb the key elements for innovation such as free-flowing talents, capital, information, technology; establish a hierarchical and classified innovation and entrepreneurship education system. All of these can satisfy the different needs of students on different innovation and entrepreneurship courses. On the foundation of creating basic innovation and entrepreneurship courses for all students, advanced level innovation and entrepreneurship courses should be opened up so that students can design their own course of study according to their own needs under the guidance of teachers. Students who need innovation and entrepreneurship practice could choose to do internships in companies or

incubators in the Guangdong-Hong Kong-Macao Greater Bay Area. For students with professional needs, professional courses that integrate innovation and entrepreneurship content can be provided to improve their professional abilities while improving their innovation and entrepreneurship awareness. Make full use of the resources of the Guangdong-Hong Kong-Macao Greater Bay Area, and establish a hierarchical and classified innovation and entrepreneurship curriculum to meet the diverse needs of different students, so as to meet the multi-level talent needs of the region. The Guangdong-Hong Kong-Macao Greater Bay Area has a large amount of capital, space and intellectual resources, and it is important to promote these resources, controlled either by governments or markets, into the innovation and entrepreneurship education system of colleges and universities so that they can play their essential roles (Li and Cui 2019).

Make Full Use of the Innovation and Entrepreneurship Competition Resources in the Guangdong-Hong Kong-Macao Greater Bay Area to Develop High-Quality Courses Dedicated to In-Depth Integration

Taking a course is the most direct way for students to receive innovation and entrepreneurship education, and it is also the most effective way to cultivate their employment and entrepreneurship awareness and ability. As important vehicles for innovation and entrepreneurship education in colleges and universities, innovation and entrepreneurship courses have a special position in the process of cultivating students' innovative spirit and entrepreneurial ability. However, in the current structure of innovation and entrepreneurship courses at universities in the Guangdong-Hong Kong-Macao Greater Bay Area, theory-based courses dominate and there is a lack of courses that integrate entrepreneurial practice and professionalism. Judging from the survey data, all students—no matter whether they were majoring in liberal arts, science and engineering, or economics and management—were dissatisfied with the current situation of there being a preponderance of innovation and entrepreneurship theory courses. Some science and engineering students even felt that existing innovation and entrepreneurship theory courses just follow textbooks and lag behind current trends of innovation and entrepreneurship in society and so neither help with research on innovation experiments nor can they guide innovation and entrepreneurship practice. An overemphasis on theory and insufficient attention to practice are shortcomings of the current innovation and entrepreneurship curriculum at colleges and universities in China. Compared with other regions of China, as mentioned above, apart from the traditional national innovation and entrepreneurship competitions such as "Challenge Cup" and "Internet +," the Guangdong-Hong Kong-Macao Greater Bay Area also has entrepreneur competitions organized by many innovation and entrepreneurship incubators. Colleges and universities should attach importance to the cultivation and absorption of entrepreneur competition resources, and incorporate entrepreneur competitions into the innovation and entrepreneurship curriculum.

In addition, long-term practice has proven that integrating innovation and entrepreneurship education into students' professional education is an effective method for cultivating technical students and innovative and entrepreneurial students (Huang and Du 2020). At present, the transformation and upgrading of industries in

the Pearl River Delta has achieved remarkable results. Each city has its own industrial advantages, such as Guangzhou's service industry, real estate, transportation, warehousing and postal services; Shenzhen's cultural creativity, high technology, energy conservation and environmental protection; Dongguan's international processing manufacturing industries, etc. These competitive industries have a high demand for professional and technical personnel with innovative and entrepreneurial awareness. When universities in the Greater Bay Area offer innovation and entrepreneurship courses, they should deeply integrate entrepreneurship education with professional education. Teachers should guide students to think from the perspective of entrepreneurs about the relevant knowledge that entrepreneurs should master when starting a business based on their major. During the course of teaching, they should show students the entrepreneurial prospects in their professional field and visualize entrepreneurship. This can not only stimulate students' professional passion and enthusiasm for entrepreneurship, it can also break through the homogenizing trend in innovation and entrepreneurship education at universities, so that students can fully absorb the benefits of their majors, turn their majors into expertise, and gain advantages in innovation and entrepreneurship.

Improve the Appointment and Performance Evaluation Mechanism for Innovation and Entrepreneurship Teachers, and Establish a Good Teacher-Student Co-Creation Model

Professional innovation and entrepreneurship teachers are crucial for innovation and entrepreneurship education. They are also fundamental for advancing innovation and entrepreneurship education to a larger scale, a higher level, and greater depth. The survey found that the insufficiencies of teachers in innovation and entrepreneurship education are not only seen in their inadequate numbers, but also reflected in the lack of enthusiasm and participation of teachers, and the lack of students' awareness of the importance of teacher guidance. Many innovation and entrepreneurship teachers responded that since the work evaluation system for innovation and entrepreneurship instructors at universities in the Guangdong-Hong Kong-Macao Greater Bay Area has not been perfected, although many universities have policies that provide incentives for teachers who participate in innovation and entrepreneurship activities, they have also vigorously encouraged professional teachers to actively participate in innovation and entrepreneurship activities, but without any significant overall effect. Some innovation and entrepreneurship teachers stop at classroom guidance, so it is difficult to go deep into a project, let alone run a business with students. In addition, because the appointment of visiting innovation and entrepreneurship instructors has not yet been systematized, it is difficult for universities in the Guangdong-Hong Kong-Macao Greater Bay Area, especially those in the 9 cities of the Pearl River Delta, to use resources in society to enrich their own body of innovation and entrepreneurship teachers. It would of course be even more difficult to bring in international talents to teach innovation and entrepreneurship. In general, there are few full-time teachers of innovation and entrepreneurship, there is limited use of off-campus innovation and entrepreneurship instructors, and there is

a lack of a mechanism for introducing innovation and entrepreneurship talents from society. Therefore, we should take advantage of the opportunities provided by reforming the regional systems and mechanisms in the Guangdong-Hong Kong-Macao Greater Bay Area, especially the environment of multicultural exchange in Hong Kong and Macao, actively to bring in innovative and entrepreneurial talents from Hong Kong and Macao, and promote the of talents in Guangdong, Hong Kong and Macao. As for measures to support all this, the first must be to perfect the appointment mechanism for visiting instructors in order to bring in entrepreneurial talents with rich practical experience—including entrepreneurs, senior business managers, investment experts or relevant government personnel—as part-time innovation and entrepreneurship teachers. We should also use the region's infrastructure with its favorable living, business, and tourism environment to draw overseas talents, to teaches students about topics including industrial structure, industry background, and industry practices. At the same time, it is necessary to improve teachers' participation in the process of students' innovation and entrepreneurship; learn the operation models of innovation and entrepreneurship projects co-created by teachers and students in internationally renowned Bay Area universities; strengthen the performance evaluation of innovation and entrepreneurship mentors in entrepreneurship guidance and stimulate the enthusiasm of professional teachers; and encourage teachers with entrepreneurial practice experience to assist students in running entrepreneurial projects.

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