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Challenges and Countermeasures of Collaborative Cultivation of Innovative Talents in Higher Education in the Guangdong-Hong Kong-Macao Greater Bay Area

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ABSTRACT

This research explores the paradigm of innovative talent cultivation in higher education within the Greater Bay Area (GBA), anchored in the foundational tenets of synergy theory. As the GBA emerges as a beacon of regional integration and development, the power of collaboration and synergy becomes evident. The study identifies both the unique opportunities and challenges that the GBA faces in talent development. Emphasizing the importance of linguistic integration and cultural identity, the research proposes a robust collaborative talent cultivation mechanism and advocates for an integrated "Industry-Academia-Research" model. Through an in-depth analysis, the paper highlights how these strategies, deeply rooted in mutual respect, understanding, and shared goals, can instigate transformative change in higher education. The insights presented serve as a valuable blueprint for regions worldwide, underscoring the GBA's pioneering approach to collaborative higher education frameworks that foster regional growth and innovation.

1. Introduction

Following the international bay areas of San Francisco, New York, and Tokyo, the Guangdong-Hong Kong-Macao Greater Bay Area (GBA, see Figure 1) has emerged as a focal point in the global economic landscape, representing a dynamic fusion of culture, economy, and innovation in the new era. Since its establishment in 2019, the GBA has demonstrated rapid growth in regional economic collaboration. This evolution is characterized by the nation's strategic infrastructure development, policy support, and the shared pursuit of economic prosperity and innovative growth across the three regions. Notably, the "Outline Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area" (hereinafter referred to as "the Outline") explicitly emphasizes the aspiration to transform the GBA into a talent hub, invigorating various innovative entities and supporting the youth of Hong Kong and Macao in their mainland endeavors [1]. Clearly, the crux of the GBA lies in the cultivation of innovative talents, which is pivotal for sustained growth and regional competitiveness. Higher education institutions (HEIs) serve as crucial bases for nurturing innovative talents, making it imperative to prioritize the cultivation of innovative talents in Higher Education (HE). In terms of HE, the three major international bay areas have collaborated and integrated university resources and organizational management, significantly enhancing the development of HE [2]. A deeper exploration into the cultivation of innovative talents in HE is warranted. Synergism theory offers a

robust theoretical underpinning for the cultivation of innovative talents in the GBA. The theory accentuates the generation of a collective effect through cooperative interaction that surpasses the sum of individual contributions, providing a compelling perspective for the GBA's HE talent cultivation approach. By amalgamating educational resources from the three regions and synergizing multi-stakeholder participation in the talent cultivation process, the GBA is poised to transcend traditional boundaries and establish a novel HE innovative talent collaborative cultivation mechanism. However, the cultivation of innovative talents in the GBA is a long-term endeavor. In such a culturally diverse and vibrant region, despite its abundant resources and unique opportunities, it still grapples with significant challenges in collaborative cultivation, stemming from cultural diversity and insufficient collaborative motivation. Currently, the GBA's innovative talent cultivation has shown initial success but still requires enhancement. On one hand, with robust policy support, achievements have been made in academic-industry collaboration and talent attraction. On the other hand, deeper exploration and strategic intervention are needed in areas such as bridging cultural disparities between the three regions, constructing a unified collaborative cultivation system, and ensuring equitable distribution of educational resources. Thus, this study, grounded in synergism theory and aligned with the GBA's unique developmental context, delves into the developmental trends of the three regions in the HE domain concerning innovative talent cultivation, aiming to elucidate the opportunities, challenges, and future directions for innovative talent cultivation in the GBA.

Figure 1 GBA Cities, Map based on Gov HK [3]

2. Literature Review

2.1 Synergism Theory

Originating from the Greek word "synergos," meaning "working together," [4] synergism emphasizes the enhanced effect produced when entities collaborate. This principle has been applied to understand complex systems, organizational behaviors, and collaborative efforts across various domains. Historically rooted in biological systems, where the combined effect of two or more drugs was observed to be greater than their individual contributions, Chou's pioneering work on the theoretical foundation of synergistic action in drug combinations provided comprehensive insights into how the combined effect surpasses the

sum of individual effects [5]. García-Fuente et al. further refined the understanding of synergism, underscoring the importance of accurately determining dose-effect curves for effective synergistic outcomes [6]. The theory subsequently demonstrated relevance in the realms of organizational and talent development. In the context of HE, synergism offers a compelling framework. Synergistic innovation, as defined by the integration, collaboration, fusion, and shared values of HEIs, enhances the efficiency, level, and quality of functional activities in regional educational cooperation [7]. Synergistic cultivation can be perceived as the embodiment of the synergistic concept in talent cultivation. The talent cultivation system in HEIs is a complex system composed of multiple subsystems, such as governments, enterprises, and HEIs, reflecting the essence of synergism theory. Specifically, talent cultivation in HEIs encompasses internal synergies among faculty allocation, specialized courses, and internship bases [8], forming an integrated educational resource and synergizing multi-stakeholder participation throughout the talent cultivation process. Hence, synergism theory forms the foundation for innovative talent cultivation in the HE domain. Moreover, the theory suggests that by fostering a collaborative and supportive environment, regions can amplify their talent development outcomes. Especially in a culturally integrated region like the GBA, coordinated synergies of diverse strengths can propel more innovations and growth, such as deepening teacher collaborative cultivation contributing to win-win regional educational cooperation [9].

2.2 Concept and Practice of Innovative Talent Cultivation

Innovative talent cultivation is a multifaceted concept that has garnered widespread attention in academia and policy circles. At its core, it refers to a systematic process of nurturing individuals' creative thinking, challenging established norms, and driving innovation in their respective fields9. The philosophy of innovative talent cultivation is rooted in the belief that innovation is not merely a spontaneous act but can be nurtured through deliberate efforts. This involves a blend of formal education, experiential learning, mentorship, and exposure to various challenges. Over the years, various models and frameworks have been proposed to encapsulate the essence of innovative talent cultivation. A prominent model is the 21st-century 4C core competency model, emphasizing critical thinking, communication, collaboration, and creativity as the four pillars of innovative cultivation[11]. Through these four core competencies, the model aims to nurture 21st-century talents for lifelong development and to address societal challenges. In practice, innovative talent cultivation often manifests in multiple educational dimensions, such as specialized programs, interdisciplinary courses, research opportunities, and academia-industry collaborations. These initiatives aim to provide individuals with a holistic learning experience, equipping them with the skills and mindset to tackle complex challenges and foster innovation. With the rapid advancements in information technology, the concept of innovative talent cultivation continues to evolve and gain contemporary significance. Zhang et al. explored the blended learning model, emphasizing computational thinking as the cornerstone of innovative talent cultivation[12]. This approach underscores the importance of integrating technology with traditional learning paradigms for effective talent development. Lei, based on the PDCA cycle theory, provided novel insights into how synergistic efforts can significantly enhance innovative talent cultivation in the context of multi-synergistic integrated circuit industries [13]. Rong et al. further delved into the transition from traditional software engineering education to the "Internet Plus" paradigm, emphasizing innovative talent cultivation methods to meet the demands of the digital age [14]. Additionally, the role of the ecosystem, comprising educational institutions, industry partners, policymakers, and society at large, is paramount. A supportive ecosystem can amplify talent cultivation efforts, creating a virtuous cycle of innovation and growth.

2.3 Current Research Status on Innovative Talent Cultivation in the GBA

The GBA is a unique confluence of culture, economy, and technology, evolving synergistically. Given its strategic significance, the region has consistently been a subject of extensive research, particularly in

the realm of innovative talent cultivation. In 2020, the Ministry of Education and the Guangdong Provincial Government released the "Development Plan for Higher Education Cooperation in the Greater Bay Area." The plan highlighted the objective of establishing world-class universities in the GBA, playing a pivotal role in realizing the vision of becoming a world-class city cluster and an international hub for talents and innovation [15]. Furthermore, the "Outline" also proposed the strategic positioning of building a "globally influential international science and technology innovation center"[1]. It is evident that innovative talent cultivation can not only align the GBA's education with global standards but also nurture seeds for establishing a science and technology innovation center. In recent years, numerous studies have begun to explore the GBA's talent cultivation methods, challenges brought about by its diverse landscape, and strategies to foster innovation. These studies are primarily concentrated in Chinese journals, with a plethora of literature focusing on the GBA's collaboration and development. As synergism, a theory promoting orderly operations between regions and different systems, many researchers have emphasized methods for the GBA to coordinate the strengths of Guangdong, Hong Kong, and Macao. This involves policy integration, academic collaboration, and industry partnerships, all aimed at creating a conducive environment for talent development. Yang et al. analyzed the knowledge innovation network within the GBA, emphasizing the region's potential and challenges posed by its diverse institutional and cultural landscape [16]. Their findings underscored the importance of strategic collaboration in promoting innovation in the region. Bai & Li conducted a comprehensive review of various talent cultivation models in the GBA, emphasizing the need for innovative approaches to cater to the region's unique requirements [17]. Other scholars have constructed synergistic cultivation models based on the GBA's industrial needs [18], aiming to achieve collaborative cultivation of talents in the field of higher engineering education. These studies provide a multidimensional understanding of the GBA's synergism theory, innovative talent cultivation practices, and unique dynamics. However, current research on innovative talent cultivation in the GBA is primarily based on a single dimension, lacking a systematic study and discourse.

3. Challenges of Collaborative Cultivation of Innovative Talents in the GBA

3.1 Opportunities for the Cultivation of Innovative Talents

The construction of the GBA is a major strategy for promoting regional coordinated development in the new era of China. This indicates a significant shift in the region's policies, funding, and manpower. Such a transformation provides more opportunities for the cultivation of innovative talents. Firstly, the policy support and geographical advantages of the GBA create an excellent platform for innovative talent cultivation, effectively accelerating resource aggregation in the region. The 19th National Congress report clearly defined the construction strategy and policy arrangements for the GBA, emphasizing its vital role as a national strategy [19]. This policy framework highlights the importance of developing the area in line with national objectives, providing a robust environment for innovative talent cultivation. As one of the most economically developed regions in China, located at the center of China's southern coastline, the GBA possesses significant geographical advantages. Internally, it boasts well-developed infrastructure and convenient transportation, especially with the full connectivity of the Hong Kong-Zhuhai-Macao Bridge and the Guangzhou-Shenzhen-Hong Kong high-speed railway, enhancing regional connectivity and promoting resource integration and industrial aggregation. Externally, it serves as a crucial gateway connecting Southeast Asia and the rest of the world. Its thriving trade, finance, and logistics industries continuously enhance the region's economic vitality, building a contemporary hub for innovative talent development.

Secondly, the 21st-century 4C talent cultivation model provides a solid theoretical foundation for the GBA's innovative talent cultivation. The 4C model, emphasizing critical thinking, communication, collaboration, and creativity, is becoming increasingly important in modern society. Critical thinking involves

logical thinking and reasoning abilities, helping learners make judgments, decisions, and solve various problems using systemic thinking. Communication refers to effectively expressing one's ideas while listening to others. Collaboration emphasizes working with others and sharing joint responsibilities. Creative thinking involves brainstorming to generate new and valuable ideas. Given the rapid changes and demands of the 21st century, especially in areas like finance, law, e-commerce, entrepreneurship, and business English [17], this model is particularly relevant. A study highlighted the effectiveness of the overall instructional design of Information Problem Solving (IPS), indicating that the 4C model can play a key role in cultivating complex skills like IPS in higher education [19]. Currently, higher education institutions in Guangdong, Hong Kong, and Macao use the 4C model as the core competency for education, jointly exploring directions for curriculum reform, providing guidance for future collaborative talent cultivation. The trend of collaborative education in the GBA is becoming more apparent, with Hong Kong universities establishing branches in the mainland, introducing more innovative teaching concepts to the mainland, and indirectly promoting educational integration between the two places. This emphasis on core competencies ensures not only that talents possess proficient skills but also that they have the soft skills required for innovation and collaboration.

Thirdly, the GBA's outstanding economic strength provides a solid material foundation for its innovative industrial development. With its active and robust economic activities, the GBA's technological innovation capabilities have also seen significant development in recent years. According to the "2020 Global Innovation Index," among the top 100 most dynamic tech clusters globally, the Shenzhen-Hong Kong-Guangzhou tech cluster ranks second, only behind the Tokyo-Yokohama tech cluster. Simultaneously, some universities in the GBA have also demonstrated outstanding research potential and innovation capabilities. Among them, 24 universities have been selected in the third-party index evaluation ranking of world universities, proving breakthroughs in the field of higher education innovation. Five universities in Hong Kong are ranked in the top 100 of the 2022 QS World University Rankings. Hong Kong universities also collaborate closely with mainland industries, achieving the transformation of scientific and technological achievements around the bay area's industrial development. Additionally, the GBA is home to a group of young and vibrant innovative enterprises. Huawei and Tencent have been listed among the world's most innovative companies, playing a leading role in the GBA's innovative enterprise development [20].

3.2 Challenges Faced by the GBA in Talent Cultivation

3.2.1 Identity Differences

The GBA integrates diverse cultural and linguistic backgrounds, making it a region with a complex linguistic ecology of multiple languages and scripts, thus facing significant identity challenges. Due to geographical and historical reasons, the common communication languages in Hong Kong society are English, Cantonese, and Mandarin. In Macao, the primary languages are Cantonese, Portuguese, and Mandarin; in the nine cities of the Pearl River Delta, they mainly use Cantonese, Mandarin, and Hakka [21]. In terms of script, Hong Kong uses English and traditional Chinese characters, Macao uses Portuguese, traditional Chinese characters, and English, while the official script of the nine cities in the Pearl River Delta is simplified Chinese [22]. The "bilingualism and trilingualism" in Hong Kong and the "trilingualism and quadrilingualism" in Macao present challenges for educational integration and talent cultivation in the GBA. These linguistic differences increase the cost of communication and collaboration in talent cultivation.

On the other hand, the GBA has a diverse and complex cultural background, and these cultural differences are significant barriers to innovation cooperation between cities [23]. Although Guangdong, Hong Kong, and Macao have historically belonged to the same Lingnan geographical and social region, sharing a

common cultural origin, the cultures of Hong Kong and Macao have long been influenced by Western characteristics due to their colonial history. This continuous collision of Chinese and Western cultures has brought diverse intellectual sparks to Hong Kong and Macao but has also caused long-standing confusion and division in identity recognition among their citizens, especially the younger generation. Cultivating innovative talents requires leveraging the benefits of multiculturalism to foster critical thinking and a broad international perspective while addressing the broader challenges brought about by identity differences. Therefore, it is essential to seek common ground while preserving differences, build a GBA cultural community, face the challenges of the real world and the Hong Kong issue, and adopt coordinated methods to promote collaborative talent cultivation.

3.2.2 Lack of a Unified System of Collaborative Education

Although the three regions within the GBA share common historical and cultural ties, the vast linguistic and cultural differences, combined with the "one country, two systems" policy differences, have resulted in three distinct education systems in the GBA. This differentiation is especially evident in higher education. Despite the emphasis on collaborative talent cultivation in the GBA's development, there is a clear lack of a unified collaborative education system. The absence of standardization may lead to inconsistencies in talent development and hinder the process of collaborative education.

Firstly, there's a lack of unity in educational philosophies and teaching models, leading to insufficient momentum for innovative education. There are significant differences in curriculum content, teaching methods, and evaluation standards among the three regions. In recent years, the GBA has actively expanded higher education resources, enlarging the scale of higher education clusters through independent fundraising and collaborative education. However, this collaboration is mainly concentrated in developed areas like Guangzhou, Shenzhen, and Zhuhai. As the GBA's construction progresses, the layout of universities from Hong Kong and Macao is gradually expanding to cities like Foshan, Dongguan, Zhaoqing, and Zhongshan. Clearly, this is an expansion of Hong Kong and Macao universities into mainland universities. How can universities in the nine cities of the Pearl River Delta accelerate their alignment with Hong Kong and Macao? How can a two-way, interconnected education model be achieved? These are topics that need exploration in the future. Additionally, from a collaborative perspective, the associated effects of the GBA's higher education cluster still appear relatively insufficient. On the one hand, there's a lack of internal association within the education system. Due to the lack of communication and reference between the educational systems of the three regions, it's challenging to smoothly transfer the learning outcomes of students from different regions and universities. This lack of educational communication also increases costs to some extent. On the other hand, the innovative effects of the higher education system's cluster are still lacking. As of 2018, the innovation influence of universities in the Guangdong-Hong Kong-Macao Greater Bay Area was relatively high, only lagging the San Francisco Bay Area [24]. Additionally, compared to the Beijing-Tianjin-Hebei region and the Yangtze River Delta region, the GBA's universities have relatively high R&D expenditure, but the number of R&D personnel is relatively low. This indirectly leads to lagging innovation outcomes, and the quality also needs improvement (see Table 1). It's evident that although the current investment in higher education resources in the GBA is growing rapidly and holds vast innovative potential, there's still significant room for improvement in the transformation and industrialization of technological achievements. The knowledge innovation and overall quality of higher education in the GBA need enhancement.

Table 1 Innovative effects of higher education clusters in the three major regions in 2018 [25]

Region Name	R&D Expenditure as a Percentage of GDP	Number of R&D Personnel	International Papers (in 10,000s)	Patent Applications (in 10,000s)	Proportion of Invention Patents	Proportion of Technology Export Turnover	Growth Rate of R&D Expenditure	Growth Rate of R&D Personnel	Growth Rate of Patent Applications
Guangdong-Hong Kong-Macao Greater Bay Area (GBA)	0.20%	47,772	4.6	2.8	55%	10%	13.20%	6.20%	21%
Beijing-Tianjin-Hebei Region	0.38%	60,126	7.4	3.4	71%	31.20%	13.20%	3.70%	11%
Yangtze River Delta Region	0.16%	91,331	13	9.5	64%	18.90%	12.90%	5.10%	12%

Data source: Guangdong-Hong Kong-Macao Greater Bay Area Higher Education Big Data Research Center

Secondly, there's a lack of efficient integration paths for teaching staff. The primary body for innovative education in higher education is the teaching staff. On the one hand, this group is the core element to ensure the overall improvement of regional higher education quality, playing a vital role in ideological guidance, knowledge dissemination, and promoting social progress. On the other hand, they are the foundation for cultivating innovative talent skills, collaborative development, and joint creation of productivity. Therefore, the teaching staff bears the reform responsibility of cross-border collaborative governance and collaborative education in the GBA. However, the inertia of different educational systems in the three regions, regional environmental differences, and uneven personnel quality restrict the identity recognition and collaborative actions of teachers. Additionally, there are differences in the training standards and core professional capabilities required for teachers in the three regions. In recent years, universities in the bay area have tried to promote reforms in the teacher collaborative training system through teacher exchanges, mutual course recognition, and other methods. The recent 5th Guangdong-Hong Kong-Macao Greater Bay Area Teacher Ethics Forum, jointly hosted by South China Normal University and the Hong Kong Education University, became an innovative attempt for the collaborative development and deep integration of education in the three regions. However, in the long run, the three regions still need to establish a comprehensive teacher training system. This can integrate university teaching resources, form a "knowledge resonance" among the teaching staff, and promote cross-domain collaboration in innovative talent cultivation.

3.2.3 Imbalance of Power

Globally, the primary approach for developed countries to cultivate innovative talents is to build an industry-academia-research model. With the continuous growth of enterprises and civil forces, the integration of industry, academia, and research in the Guangdong-Hong Kong-Macao Greater Bay Area's talent

cultivation model is becoming increasingly evident. Although more and more enterprises are trying to cooperate with universities, such as jointly cultivating doctoral students through collaborative education and setting up laboratories for talent R&D and innovation, most collaborations between universities, enterprises, and civil forces in the GBA are spontaneous and autonomous, inevitably facing restrictions in the process. Coupled with the imbalance of rights among these entities, it's challenging to form a joint educational force, which may hinder the formation of collaborative education and affect the overall goal of innovative talent cultivation.

Firstly, the innovative concept of collaborative education is relatively lagging, and the intrinsic motivation for collaboration among the main bodies is weak. The "2020 China Patent Survey Report" showed that the collaborative innovation rate of enterprises, universities, and research institutions was 6.5% [26]. This clearly indicates that the current collaborative momentum in China, and specifically in the GBA, is noticeably insufficient. According to a survey report on the industry-academia-research situation in Guangdong Province, a major region of the GBA, 92.95% of universities are involved in industry-academia-research cooperation, with key universities participating at a rate of 100% [27]. However, the focus of universities, enterprises, and research institutions is not unified, leading to a gap in talent cultivation goals and needs. The lack of a unified talent cultivation standard also makes it difficult to achieve deep collaboration.

Secondly, the system for building collaborative education is not well-established, and there's an imbalance in the levels of collaboration among the main bodies. Due to the inherent complexity and uniqueness of the GBA's internal systems, there's still no reasonable operating management mechanism formed among regional governments, universities, enterprises, research institutions, and even civil organizations. Currently, the GBA's industry-academia-research cooperation lacks reasonable institutional arrangements in terms of policy support, resource collaboration, cooperation models, and feedback mechanisms. This leads to a lack of cooperation within a set of operating rules, resulting in vague cooperation goals, unclear responsibility divisions, restricted resource integration, and unstable sustainable cooperation. Additionally, with the imbalance in the levels of collaboration among the main bodies, communication often focuses on project cooperation, making it difficult to form a long-term, in-depth cooperation mechanism.

Thirdly, the civil forces in collaborative education are restricted, unable to stimulate market vitality. Civil forces include non-governmental organizations, community groups, charitable organizations, and other non-profit organizations, which have tremendous potential in educational cooperation. On the one hand, civil forces can act as bridges between universities, enterprises, and governments, promoting communication and cooperation among all parties. On the other hand, compared to traditional educational institutions, civil forces have greater flexibility in project implementation, fundraising, and talent cultivation. This flexibility often places a higher emphasis on innovation and can quickly adapt to changes in the education sector. For example, the Tin Ka Ping Foundation, as an essential representative of civil forces, frequently collaborates with universities and encourages innovation, which is very beneficial for cultivating innovative talents. In recent years, some think tanks have also begun to explore collaborative education. However, the development of these civil organizations still faces many restrictions. Among them, limitations in funds and resources, and insufficient policy support are often the most significant influencing factors. These not only restrict their operational scale but also affect their role in educational cooperation. Additionally, due to differences in culture, values, and operating models, there may be cooperation barriers between civil forces and universities and enterprises. These barriers may include trust issues, unclear cooperation mechanisms, etc. Furthermore, public misunderstandings and doubts about the role of civil forces in education may also affect their ability to raise funds, recruit volunteers, and cooperate with other organizations.

4. Strategies for Collaborative Cultivation of Innovative Talents in the GBA

4.1 Philosophical Foundation: Language Integration and Cultural Identification

Strengthening language integration and cultural identification in the GBA is crucial for promoting regional integration and talent cultivation. Efforts should be made to transform the linguistic resources of the GBA into cultural capital that promotes regional integration, reinforces national identity, and enhances national competitiveness. On one hand, the rich linguistic ecosystem should be integrated into the higher education talent cultivation system. The promotion of multilingualism, combined with the study of traditional Chinese and regional cultures, will enable talents in the GBA to better understand the cultural implications behind linguistic diversity, fostering a sense of belonging to the GBA. There should also be an emphasis on cultivating international talents through a "Chinese + profession" approach, connecting efforts in faculty development, resource construction, and mechanism innovation through a common language. Moreover, leveraging the abundant resources of the GBA, there's a need to enhance the cultivation of linguistic talents. The unique geographical advantage of the GBA presents a distinctive higher education landscape, with diverse types of institutions, varied operational models, and an evolving interdisciplinary academic structure. This diverse educational environment provides an excellent backdrop for innovating linguistic talent cultivation mechanisms. Efforts should be made to establish collaborative mechanisms for linguistic talent cultivation, enhancing the efficiency and quality of talent cultivation through resource sharing and complementarity [28]. On the other hand, cultural identification is the foundation for innovative collaborative education. It's essential to address the spiritual and cultural needs of the youth in the GBA, guiding them towards a shared cultural consensus and enriching the cultural essence of the GBA.

4.2 Mechanistic Provision: Collaborative Talent Cultivation Mechanism in the GBA

Collaborative talent cultivation in the GBA is an ambitious endeavor, necessitating a comprehensive cultivation mechanism that encompasses top-level design, mid-level systemic interactions, and micro-level practical implementations. From a top-level design perspective, national policies should be refined to provide macro-level guidance for collaborative talent cultivation, such as planning for university clusters, facilitating faculty exchanges, and integrating talent mobility elements. Under collaborative development objectives, both central and local governments should continue to play a guiding role. From a mid-level systemic interaction perspective, collaborative talent cultivation in the GBA requires policy support and coordinated efforts from educational authorities, offering a robust shared platform. For instance, policies should be formulated to define the objectives, content, and steps for university collaborative cultivation. In terms of regulatory governance, there's a need to explore effective directions for evaluating the quality of collaborative higher education, establishing a scientific and efficient dynamic quality supervision system. Additionally, policies that promote integration across the three regions, such as policies for integrating youth from Hong Kong and Macau into the mainland, should be strengthened. From a micro-level perspective, the focus should be on joint teacher training models, utilizing collaborative education platforms for dynamic cooperation. The establishment of a comprehensive development platform for teacher education in the GBA and the construction of professional development training bases for teachers are key to promoting collaborative teacher cultivation. Furthermore, digital platforms should be utilized to create online resource-sharing platforms. The introduction of technologies like cloud computing, big data, and AI can further deepen the integration of collaborative teacher cultivation. The GBA's teacher education collaboration, with its wide scope and significant impact, is a crucial avenue for promoting regional collaborative talent cultivation, providing solid support for nurturing innovative talents in the GBA.

4.3 Collaborative Model: Integration of Industry, Academia, and Research

Under the collaborative theoretical framework, the construction of a talent cultivation mechanism relies on the cooperation of governments, universities, and enterprises. This collaboration aims to establish a balanced and effective evaluation system, achieving a dynamic balance between university talent cultivation and corporate talent cultivation. The integration of industry, academia, and research provides a clear development path for collaborative talent cultivation. Firstly, various stakeholders should integrate their collaborative talent cultivation philosophies, seeking common ground while preserving differences, and strengthening the initiative and responsibility of all parties. Universities, as major venues for talent cultivation, should clarify the purpose and objectives of innovative talent cultivation, constructing an open and innovative system of resource sharing, mutual benefits, joint projects, and collective talent cultivation. Enterprises should play a role in guiding students to translate academic knowledge into practical applications, while research institutions should provide advanced research platforms to compensate for the deficiencies in university research facilities. Secondly, efforts should be made to enhance the collaborative talent cultivation capabilities of all stakeholders, refining the mechanisms for industry-academia-research collaborative cultivation. Establishing management institutions for the GBA's industry-academia-research collaborative cultivation system will facilitate coordination, communication, benefit distribution, and collaborative cultivation among all parties. Information flow and resource integration are essential for ensuring the coordinated operation of all stakeholders. Therefore, through the integration of university curricula, corporate implementation platforms, and research institution outcome transformation mechanisms, the efficient operation of the industry-academia-research integration model can be realized. Lastly, private entities should be encouraged to actively participate in the collaborative talent cultivation initiative, exploring new paths for think tank collaborative cultivation. Think tanks, as the "brain trusts" and "idea repositories" of the modern era, have a unique role in collaborative talent cultivation. To nurture innovative talents, it's advisable to establish a GBA Think Tank Alliance, strengthening regional collaboration in talent cultivation and expanding its outreach, providing more opportunities for the youth to engage on a broader social platform and gain more innovative practical experiences.

5. Conclusion

Amidst the evolving dynamics of regional integration, the GBA epitomizes the potency of collaboration and synergy, particularly in the domain of higher education. The narrative of the GBA, as delineated in this paper, accentuates the criticality of fostering innovative talent within higher educational institutions, thereby promoting regional unity and sustainable advancement. As postulated by scholars like Gray and Westly, collaboration fundamentally revolves around diverse entities harnessing their multifarious strengths and distinctions to surmount inherent challenges. Through mutual value generation and concerted participation, they proffer solutions to pressing imperatives. The GBA's initiatives in amalgamating varied cultural vistas, championing innovation via the "Chinese + Profession" approach and harnessing the "Industry-Academia-Research" collaborative model resonate with this spirit of cooperation. These endeavors are not merely about bridging gaps but about crafting a cohesive matrix of shared values, aspirations, and objectives, all pivoting around the central role of higher education in molding future innovators. Moreover, the GBA's synergistic blueprint for talent cultivation in higher education, articulated through strategic design, systemic collaboration, and grassroots implementation, mirrors a comprehensive strategy for nurturing future trailblazers. By engendering an ambiance conducive to scholastic prowess and innovative ideation, the GBA ensures its intellectual capital is primed with the requisite competencies, acumen, and ethos for the region's sustained ascendancy.

In summation, the GBA's trajectory furnishes invaluable insights into the pivotal role of higher educa-

tion in regional metamorphosis and the transformative essence of collaboration. By capitalizing on the unique competencies of diverse entities and fostering a unified vision of innovative talent development, the GBA is delineating a roadmap towards a luminous, more harmonized future. As the region perpetually evolves, it stands as a luminary for global counterparts, exemplifying how collaboration, deeply rooted in mutual respect, comprehension, and shared aspirations, can catalyze monumental shifts. The insights gleaned from the GBA's odyssey underscore the paramountcy of collaborative endeavors in higher education in today's interconnected milieu, offering a paradigm for regions aspiring to analogous milestones of integration and progression.

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