



# A Quantitative Research to Coupling and Coordination for Red Tourism with Ideological and Political Education Development of College Students in Guangdong-Hong Kong-Macao Greater Bay Area

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**Abstract.** Red tourism is the innovative form of ideological and political education for contemporary college students as well as fruit of red culture education through computer and modern information technology. An quantitative study is conducted on the coupling and coordinated development of red tourism and ideological and political education of college students in Guangdong-Hong Kong-Macao Greater Bay Area with questionnaires method. The development level and influencing factors of the coupling coordination degree of both parties are evaluated profoundly by integrating the relative development degree and grey correlation degree method, and the correlation degree is calculated and ranked. The result shows that the degree of coupling coordination is in the order of Central region, Western region, Northern region and Eastern region from high to low with five factors. The paper puts forward six strategies to offer reference for further coupled coordination development of Guangdong-Hong Kong-Macao Greater Bay Area and other areas in red tourism and college students' ideological education.

**Keywords:** red tourism · ideological and political education · college students · coupling and coordination · Guangdong-Hong Kong-Macao Greater Bay Area

## 1 Introduction

Red tourism is an important way to remember red history, carry forward the red culture and carry forward the red spirit, which can be combined with ideological and political education in colleges and universities. Ideal and belief education is one of the contents of ideological and political education for college students. The development of ideological and political education activities is an important process of ideological and political education, which needs to guide the educated to realize the process from moral cognition to behavior transformation, so as to cultivate the practical ability of moral character of

college students [1]. The process of “knowledge and practice transformation” can be realized by moving from the ideological and political classroom to the red education base.

## 2 Literature Review

Since the 21st century, the development of red tourism research in China has formed certain professional knowledge. Zhu (2016) summarized the domestic research and development of red tourism to the red culture inheritance and the changes of the connotation [2]. Li (2019) pointed out that the red tourist attractions as the patriotism education demonstration base, being conducive to cultivating patriotic consciousness and the cultivation of socialist core values [3]. Liu (2020) studies the cultural value and educational function of red tourism [4]. Nevertheless, most of the existing research is theoretical research, and the application of ideological and political education in colleges and universities in the Guangdong-Hong Kong-Macao Greater Bay Area is limited, it has little role in guiding the implementation of collaborative development in the future.

According to Yu (2019), Guangdong, Hong Kong and Macao belong to different administrative regions, it is hard to achieve the level of cooperation and functions required by the integrated development of the Greater Bay Area [5]. In response to the widespread theoretical debate on the role of developmental states in promoting higher education and research in Asia, Mok et al. (2020) explored the synergy between the Chinese government, enterprises and universities in promoting innovation-centered entrepreneurship [6]. So far, domestic and foreign scholars have made few explorations on the ideological and political education in the Guangdong-Hong Kong-Macao Greater Bay Area. However, the Greater Bay Area is rich in red tourism, and its close integration with the ideological and political education of college students needs to be studied and further explored.

Based on massive bay area of Guangdong, the paper combines with the pairing coordination degree analysis method analyzes the influence factors of red tourism education for college students, reveals the existing problems and the possibility of coordinated development, puts forward the corresponding strategy so as to promote the development of red tourism and college students' political education education better interaction for the dynamic and benign development between red tourism and ideological and political education of college students in the Guangdong-Hong Kong-Macao Greater Bay Area.

## 3 Research Methods

According to Cong's (2019) research on the form and nature of the coupling degree model [7] and the coupling and coordinated development evaluation system proposed by Liu et al. (2011) [8], the coupling and coordinated development model are adopted to quantitatively evaluate the coordinated development practice between red tourism and ideological and political education of college students. The development level and influencing factors of the coupling coordination degree of both parties are evaluated profoundly by integrating the relative development degree and grey correlation degree method, and the correlation degree is calculated and ranked.

### 3.1 Evaluation Model of Coupling Coordination Degree

$$C = \left[ \frac{S_1 \times S_2}{\left(\frac{S_1+S_2}{2}\right)^k} \right]^{\frac{1}{k}} \tag{1}$$

In Eq. (1), C is the coupling degree of red tourism and ideological and political education of college students, and the value interval is [0, 1]. The larger C is, the stronger the interaction between the two. S<sub>1</sub> and S<sub>2</sub> are the composite index of red tourism and ideological and political education of college students respectively. K is the adjustment coefficient, and let k = 2 [7]. In order to further reflect the true level of coupling coordination between the two systems of red tourism and college students' ideological and political education, it is necessary to construct the coupling coordination degree to avoid the defects of coupling degree model in evaluating the interaction strength.

$$\begin{aligned} R &= \sqrt{C \times T} \\ T &= \alpha \times S_1 + \beta \times S_2 \end{aligned} \tag{2}$$

In Eq. (2), R is the coupling coordination degree, and T is the comprehensive coordination index between systems. And the two undetermined coefficients α + β = 1. For the convenience of computation, this paper assumes that red tourism is as important as ideological and political education of college students, so α = β = 0.5.

### 3.2 Relative Degree of Development

$$D = S_1 / S_2 \tag{3}$$

In Eq. (3), D is the relative development degree, S<sub>1</sub> and S<sub>2</sub> respectively represent the comprehensive index of red tourism and college students' ideological and political education.

### 3.3 Grey Relational Degree Method

In order to further study the influencing factors of coupling coordination degree, grey relational degree analysis method is introduced here to judge the major and minor factors affecting the development of the system.

$$\begin{aligned} \delta_i(t) &= \frac{\Delta_{\min} + \rho \Delta_{\max}}{\Delta_i(t) + \rho \Delta_{\max}} \\ R_i(t) &= \frac{1}{n} \sum_{t=1}^n \delta_i(t) \end{aligned} \tag{4}$$

In Eq. (4), is the grey correlation coefficient, and are the two-level maximum and minimum values of the coupling coordination degree of the reference sequence and the absolute difference of each comparison sequence respectively, and are the discrimination coefficient, usually let ρ = 0.5. In addition, R<sub>i</sub>(t) represents the gray correlation degree. The greater the value, the stronger the impact of the indicators in the evaluation system of the development of red tourism and college students' ideological and political education on their coupling coordination degree.

### 3.4 Data Sources

Since it is difficult to obtain relevant data on red tourism and ideological and political education of college students in the Guangdong-Hong Kong-Macao Greater Bay Area, and some data are not officially available, this paper divides the Greater Bay Area into four regions based on the regional division method of Yuan et al. [9] (2021): Central region, Western region, Eastern region and Northern region. The regional coupling of red tourism and ideological and political education is empirically analyzed by local college students. First, the central cities of the Guangdong-Hong Kong-Macao Greater Bay Area are Shenzhen, Guangzhou, Hong Kong and Macao, which are the core engines of regional development with strong economic strength and leading internationalization level. Therefore, they are divided into the same region. Second, based on the central cities, Western region includes Jiangmen, Zhongshan and Zhuhai, mainly facing the west wing of Guangdong. Third, Eastern region includes Huizhou and Dongguan, and mainly faces the eastern wing of Guangdong. Fourth, Northern region includes Zhaoqing and Foshan, mainly facing the northern part of Guangdong.

In order to study the coupling and recognition degree of red tourism and ideological and political education of college students in different regions of the Guangdong-Hong Kong-Macao Greater Bay Area, questionnaires were used to collect valid data. This questionnaire was distributed from February 28, 2021 to March 10, 2021. Affected by the epidemic, it was conducted online. A total of 517 questionnaires were distributed and 352 were recovered, with a recovery rate of 68.09%. Finally, through the sorting and screening of the collected questionnaires, 28 invalid questionnaires with obvious inconsistent answers and completely consistent answers were removed again. A total of 324 valid questionnaires were recovered, including 83 in Central region, 81 in Western region, 80 in Eastern region and 80 in Northern region with an effective recovery rate of 92.05%.

## 4 Data and Analysis and Results

### 4.1 Connotation of Coupling Coordination

With the aid of expert consultation method, this paper continuously engaged in red tourism with 20 experts and college students' ideological education scholars, based on Delphi method, expert consultation and investigation, the evaluation system of indicators shall be carried out in accordance with the important assignment, experts and scholars on the basis of their own judgment to index score, after all the opinions for unified summary, the evaluation conclusion [10], The analytic hierarchy process (AHP) was used to calculate the weight. After referring to the expert scores, the existing weight score conversion in relevant references was added in the later stage, and the weight was calculated again (as shown in Table 1 and Table 2).

After the above evaluation, the red tourism evaluation referred to in this paper includes four aspects: educational value, product diversity, cultural experience and considerate service; the evaluation of ideological and political education of college students includes four aspects: ideological quality, political accomplishment, moral consciousness and psychological quality. Red tourism and ideological and political education

of college students complement each other. The two systems are independent of each other, but the internal elements of the two systems influence and connect with each other according to a certain mechanism.

## 4.2 Red Tourism Evaluation Index System

In order to focus on the research, this paper integrates and cuts the red tourism evaluation indicators into four dimensions with a total of 11 indicators (As shown in Table 1) with the scale design of scholars such as Chang (2018) [11] and Zhang (2009) [12] which are on the index division basis of the tourist satisfaction evaluation indicators in red scenic spots and the core competitiveness evaluation indicators of red tourism. The red tourism system mainly includes four aspects: educational value, product diversity, cultural experience and considerate service. Educational value (B1) includes patriotism education (C1), ideals and beliefs education (C2), and revolutionary tradition education (C3). Product diversity (B2) includes tourism product creativity (C4), tourism product mix (C5), and tourism product diversity (C6). Cultural experience (B3) includes red-themed activities (C7), local culture (C8) and cultural integration of scenic spots (C9). Good service (B4) includes professional degree of docents (C10) and supporting facilities (C11).

**Table 1.** Red tourism evaluation index system (Owner-drawing)

The target layer	Rule layer	The weight	The secondary indicators	The weight	Attribute
Red tourism evaluation A1	Education value B1	0.2415	Education of patriotism C1	0.1463	+
			Ideal and belief education C2	0.0325	+
			Revolutionary traditional education C3	0.0627	+
	Product variety B2	0.4814	Creativity of tourism products C4	0.3274	+
			Tourism product mix C5	0.0716	+
			Diversified tourism products C6	0.0824	+
	Cultural experience B3	0.2028	Red theme activities C7	0.0287	+
			Local characteristic culture C8	0.1064	+
			Cultural integration of scenic spots C9	0.0677	+
	Good service B4	0.0743	Docents professional level C10	0.0495	+
			Supporting service Facilities C11	0.0248	+

**Table 2.** Evaluation of ideological and political education index of college students (Owner-drawing)

The target layer	Rule layer	The weight	The secondary indicators	The weight	Attribute
Evaluation of ideological and political education of College students A2	Thought quality B5	0.3097	The outlook on life C12	0.1239	++
			Values C13	0.1239	+
			World view C14	0.0619	+
	Political literacy B6	0.4088	Political position C15	0.1693	+
			Political consciousness C16	0.2395	+
	Moral consciousness B7	0.1841	Social morality C17	0.1012	+
			The professional ethics C18	0.0386	+
			Traditional virtue C19	0.0442	+
	The psychological quality B8	0.0975	The physical and mental health C20	0.0451	+
			Will quality C21	0.0182	+
			Emotional attitude C22	0.0348	+

**4.3 The Evaluation Index System**

According to the evaluation index system of the effectiveness of ideological and political education for college students proposed by Wu (2017) [10] and the actual needs of this study, the evaluation index of ideological and political education for college students is divided into 4 dimensions and 11 indicators (As shown in Table 2). The ideological and political education system of college students mainly includes four levels: ideological quality, political accomplishment, moral consciousness and psychological quality. Ideological quality (B5) includes outlook on life (C12), values (C13) and world outlook (C14). Political literacy (B6) includes political stance (C15) and political awareness (C16). The aspect of moral consciousness (B7) includes social morality (C17), professional ethics (C18) and traditional virtues (C19). Psychological quality (B8) includes physical and mental health (C20), will quality (C21), emotional attitude (C22).

**4.4 Analysis of Basic Characteristics of Respondents**

Reliability analysis is an important way to verify the credibility of the questionnaire results in this paper. Only the convincing analysis results conform to a certain value range can the questionnaire data have reference and use value. When  $\alpha > 0.9$ , it is very reliable. When  $0.8 < \alpha < 0.9$ , it is more reliable. When  $0.7 < \alpha < 0.8$ , it is barely credible. When  $\alpha < 0.7$ , it is not trusted. The reliability of 22 evaluation index data was analyzed in this paper, and the Cronbach coefficient  $\alpha$  was  $0.936 > 0.9$ , indicating that the questionnaire data were very credible and suitable for data analysis.

**Table 3.** Descriptive statistics of basic characteristics of respondents (n = 324) (Owner-drawing)

Variable	The basic characteristics of	Frequency (%)	Variable	The basic characteristics of	Frequency (%)
Gender	Male	143 (44.14%)	Number of red tourism trips	1 time or less	175 (54.01%)
	Female	181 (55.86%)		2–3 times	116 (35.80%)
Record of formal schooling	Junior college	30 (9.26%)		4–5 times	20 (6.17%)
	Undergraduate course	247 (76.23%)		6 times or more	13 (4.01%)
	A master's degree	34 (10.49%)	Red tourism consumption	2000 RMB yuan and below	212 (65.43%)
	Doctor	13 (4.01%)		2001–4000 RMB yuan	89 (27.47%)
The region where the school is located	Central region	83 (25.62%)		4001–6000 RMB yuan	18 (5.56%)
	Western region	81 (25.00%)		6001 or more RMB yuan	5 (1.54%)
	Eastern region	80 (24.69%)			
	Northern region	80 (24.69%)			

This survey has a certain randomness with SPSS 26 being used for descriptive analysis to obtain the basic characteristics of the respondents as Table 3 shown for specific data.

#### 4.5 Coupling Coordination Degree Analysis

Table 4 showed the comprehensive scores of red tourism and college students' ideological and political education comprehensive index Z1, Z2 and each index system. According to the results of the composite index calculation, the development of ideological and political education of college students in the four regions of the Guangdong-Hong Kong-Macao Greater Bay Area was ahead of the red tourism. Meanwhile, the red tourism composite index of the Central region and Western region was slightly higher than that of the Eastern and Western regions. In addition, further analysis of the score coefficients of each index showed that in the red tourism system, the score of educational value in the four regions was higher, and the score of product diversity was the lowest. In the ideological and political education system of college students, the score of political literacy in the four regions was high, and the score of psychological quality was the

**Table 4.** Index system score table of each system (Owner-drawing)

System/subsystem	Central region	Western region	Eastern region	Northern region
Red tourism composite Index Z1	3.5179	3.5573	3.4076	3.4907
Education value (0.2415)	3.7661	3.7273	3.8524	3.7117
Product variety (0.4814)	3.2924	3.2172	3.0619	3.1802
Cultural experience (0.2028)	3.5702	3.6566	3.4238	3.5901
Good service (0.0975)	3.6623	3.8712	3.6071	3.6351
Comprehensive index of ideological and political education of college students Z2	3.7270	3.6919	3.6737	3.6855
Thought quality (0.3097)	3.7690	3.5808	3.6000	3.6532
Political literacy (0.4088)	3.7807	3.5909	3.7286	3.6824
Moral quality (0.1841)	3.6287	3.5445	3.7571	3.5721
The psychological quality (0.0975)	3.5322	3.4495	3.5714	3.4550

lowest. It indicated that the students’ satisfaction with the variety of red tourism products and their psychological quality of ideological and political education was the lowest.

Respectively using the range method, the center of a large bay area of Guangdong area, west, east, north of the red tourism comprehensive index and college students’ ideological education comprehensive index normalized processing, and then use the coupling (1) model and the coupling coordination degree model (2) formula calculate coupling and coupling coordination degree of the two, the final measurement results as shown in Table 5. According to the index evaluation index, the superior the coupling coordination index, the stronger the benign coupling effect between the red tourism and the ideological and political education of college students in the region, the better the comprehensive benefit.

As shown in Table 6, based on the calculation results of the coupling coordination degree of red tourism and ideological and political education of college students in the four regions of the Guangdong-Hong Kong-Macao Greater Bay Area, the coupling coordination development stages of red tourism and ideological and political education of college students in the Central region, Western region, Eastern region and Northern region were divided according to Table 7. In general, the coupling and coordinated development level of each region in the Greater Bay Area was the Central region (0.9226), Western region (0.7643), Northern region (0.5954), and Eastern region (0.1000) in descending order. It showed that the coupled development of red tourism and college students’ ideological and political education in the Guangdong-Hong Kong-Macao Greater Bay Area was characterized by high-quality coordination in Central region, intermediate



**Table 5.** Calculation results of coupling coordination degree in the Guangdong-Hong Kong-Macao Greater Bay Area (Owner-drawing)

Region	C value of coupling degree	Coordination index T value	Coupling coordination degree D value
Central region	0.9887	0.8610	0.9226
Western region	0.8753	0.6673	0.7643
Eastern region	1.0000	0.0100	0.1000
Northern region	0.9081	0.3903	0.5954

**Table 6.** Coupling coordination analysis of red tourism and ideological and political education of college students (Owner-drawing)

Region	Coupling coordination degree D value	Coordination level	Coupling coordination stage
Central region	0.9226	10	Good coordination
Western region	0.7643	8	Intermediate coordinate
Eastern region	0.1000	2	A serious imbalance between
Northern region	0.5954	6	Barely coordination

coordination in the Western region, barely coordination in Northern region, and serious imbalance in Eastern region.

Combining with the classification methods of Liu (2011) [8] and the specific situation of the research data, the coupling and coordinated development of red tourism and ideological and political education of college students in the Guangdong-Hong Kong and Macao Greater Bay Area can be roughly divided into 3 major stages and 9 types. The specific classification criteria are shown in Table 9.

According to the relative development degree model of formula (3), the relative development degree of the four regions in the Guangdong-Hong Kong-Macao Greater Bay Area can be obtained being shown in Table 8. According to the division basis, Central region (0.9439) was in coordination stage viii, in this stage, red tourism and ideological and political education of college students tended to be synchronized in mutual coordination; Western region (0.9635) was in coordination stage ii. In this stage, red tourism and ideological and political education of college students tended to be synchronized in mutual antagonism. Northern region (0.9471) was in the ruin stage v, in which red tourism and ideological and political education of college students tended to be synchronized in the mutual ruin. Eastern region (0.9276) was in antagonistic stage v, in which red tourism and ideological and political education of college students tended to be synchronized in the mutual running in.

**Table 7.** Classification standard of coupling coordination degree (Owner-drawing)

Coupling coordination degree D value interval	Coordination level	Degree of coupling coordination
(0.0~0.1)	1	Extreme imbalance
[0.1~0.2)	2	A serious imbalance between
[0.2~0.3)	3	Moderate disorders
[0.3~0.4)	4	Mild disorder
[0.4~0.5)	5	On the verge of disorder
[0.5~0.6)	6	Barely coordination
[0.6~0.7)	7	Primary coordination
[0.7~0.8)	8	Intermediate coordinate
[0.8~0.9)	9	Good coordination
[0.9~1.0)	10	High quality coordination

**Table 8.** Summary of coupling coordination degree and relative development degree in the Guangdong-Hong Kong-Macao Greater Bay Area (Owner-drawing)

Region	Comprehensive evaluation of Red tourism	Comprehensive evaluation of ideological and political education of college students	Relative degree of development	Degree of coupling coordination
Central region	3.5179	3.727	0.9439	0.9226
Western region	3.5573	3.6919	0.9635	0.7643
Eastern region	3.4076	3.6737	0.9276	0.1000
Northern region	3.4907	3.6855	0.9471	0.5954

**4.6 Analysis of Influencing Factors of Coupling Coordination**

According to the result of the measurement process of the coupling coordination degree and above, will be a large bay area of Guangdong in different regions of the coupling coordination degree as the reference sequence, the red tourism and college students' ideological education in the index system of the rule layer sequence of initial value as compared with grey correlation model (4) to calculate each index of grey correlation degree, The higher the gray correlation degree is, the higher the ranking is, indicating that the index has a greater impact on the coupling coordination degree, and the closer it is. The specific correlation coefficient calculation results are shown in Table 10, and the ranking of grey correlation degree is shown in Table 11.

**Table 9.** Relative development stages of red tourism and ideological and political education of college students (Owner-drawing)

Type	Characteristics of coupling and coordination development types	Stage of development	Phase characteristics
I	Red tourism lags behind the development of college students' ideological and political education	Antagonism phase	Extensive
II	Red tourism develops synchronously with ideological and political education of college students		The same
III	Red tourism advanced the development of college students' ideological and political education		Excessive
IV	Red tourism lags behind the development of college students' ideological and political education	Running-in stage	Extensive
V	Red tourism develops synchronously with ideological and political education of college students		The same
VI	Red tourism advanced the development of college students' ideological and political education		Excessive
VII	Red tourism lags behind the development of college students' ideological and political education	Coordinate phase	Extensive
VIII	Red tourism develops synchronously with ideological and political education of college students		The same
IX	Red tourism advanced the development of college students' ideological and political education		Excessive

It can be seen from Table 11 that the greater the value of grey correlation degree, the greater the degree of influence and closeness. According to the influence degree of Jiang (2021) [13] on the gray correlation degree, and comprehensively considering the concentration of the research data, the average gray correlation degree of 0.64 was taken as the reference value. If the grey correlation degree was greater than 0.64, it indicated that the influencing factors have a strong correlation with the change of coupling coordination degree, while if the grey correlation degree was less than 0.64, it indicated that the influencing factors have a low correlation with the change of coupling coordination degree. In summary, the main factors affecting the coupling coordination between red

**Table 10.** Calculation results of grey correlation coefficient (Owner-drawing)

Region	Value of education	Diversity of products	Cultural experience	Good service	Thought quality	Political literacy	Moral consciousness	The psychological quality
Central region	0.9375	0.3447	0.5853	0.7615	0.9267	0.8855	0.6861	0.5342
Western region	1.0000	0.3893	0.8615	0.6843	0.7123	0.7291	0.6578	0.5480
Eastern region	0.3504	0.8500	0.5823	0.4538	0.4577	0.3959	0.3844	0.4742
Northern region	0.5508	0.4515	0.7487	0.6608	0.6311	0.5883	0.7908	0.8838

**Table 11.** Ranking of grey relational degree results (Owner-drawing)

Evaluation of item	Correlation	Ranking
Education value	0.7097	1
Product variety	0.5089	8
Cultural experience	0.6944	2
Good service	0.6401	5
Thought quality	0.6820	3
Political literacy	0.6497	4
Moral consciousness	0.6298	6
The psychological quality	0.6101	7

tourism and ideological and political education of college students in the Guangdong-Hong Kong-Macao Greater Bay Area were educational value, cultural experience, ideological quality, political literacy, and thoughtful service. The secondary factors were moral consciousness, psychological quality and product variety.

## 5 Strategy and Conclusion

Dig deep red connotation, strengthen tourism education function. By integrating into the social classroom, red tourism realizes the cooperative education mode of complementary resources [4]. Optimize red tourism products and enhance the experience of red culture. Reform ideological and political education mode, establish red tourism bases. Strengthen students’ ideological and political literacy, improve students’ awareness of participation. College students are in a critical stage of transition from school to society, and their sense of gain from ideological and political education cannot be separated from the objective existence of the ideological and political education for college students, but also from their self-awareness and subjective feelings about the sense of gain [11]. Hold the red

theme competition to improve students' personal ability. It not only promotes the red culture, but also helps to stimulate the market vitality. Perfect tourism service facilities and improve students' satisfaction.

In general, college students in the Guangdong-Hong Kong-Macao Greater Bay Area have low degree willingness to participate in red tourism, and they mainly visit three classic scenic spots of national red tourism in Shenzhen, Guangzhou and Zhongshan. The comprehensive index of red tourism is the same, but slightly lower than the comprehensive index of college students' ideological and political education. In terms of development stage and degree, red tourism and ideological and political education of college students show the characteristics of "the central and western parts of the Guangdong-Hong Kong-Macao Greater Bay Area are well coupled, while the northern and eastern parts are poorly coupled". The main influencing factors are educational value, cultural experience, ideological quality, political literacy and considerate service.

There are limitations in this paper. To a certain extent, the data distribution at the educational level is ignored, and the subjectivity of data acquisition is strong. Therefore, it is not possible to analyze and predict the coupled and coordinated development of red tourism and ideological and political education of college students in the Guangdong-Hong Kong-Macao Greater Bay Area in the way of time series.

In future research, we should not only strengthen the interaction and cooperation but also sort out the basic data. Improve the survey method, expand the survey object; optimize measurement indexes and develop data collection channels. Record data changes continuously so as to grasp development changes of the coupling and coordination and predict the future development trend.

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