



# Factors Affecting China's Internationalization of Its High-Speed Rail and Rail Transit Education: A Case Study of Thailand

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**Abstract.** In recent years, as China's high-speed railway as an essential export began to go overseas, the cooperative school-running mode of high-speed rail and rail transit major has gradually become an essential supplement to the sino-foreign cooperative school-running mode. Due to the limited current research literature on the cooperative school mode of high-speed rail and rail transit majors, the accurate connotation definition of the cooperative school mode of high-speed rail and rail transit majors is not unified, and exploring the factors affecting the Chinese and foreign school-running mode has become the research goal of this paper. In-depth interviews were conducted with five teachers through Delphi technology, quantitative analysis was employed on a sample of 100 students, studied the influencing factors of Sino-foreign cooperative school-running mode, and obtained the key factors of influence. The research results found that historical and cultural, subjective, objective, and training modes were the key factors, among which the training mode was the most influential. It expounded that the current project faces some challenges and difficulties and proposes corresponding countermeasures to promote further high-speed rail education in Sino-foreign cooperation and rail transit majors.

**Keywords:** Cooperative education · influencing factors · Sino Thai “1 + 1 + 3” model

## 1 Introduction

### 1.1 Background

With the opening of the “Belt and Road” pan-Asia railway cooperation project, the China-Thailand railway cooperation project, and the relevant decision of the 22nd group meeting of China-Thailand railway cooperation, the Bangkok-Horat section of Thailand high-speed railway project will be open to traffic in 2021. According to the project agreement, China teaches technical skills such as maintaining and operating high-speed

rail and rail transit to Thai employees. Thailand urgently needs operation and maintenance personnel for the high-speed rail project. According to a plan launched by China and Thailand after announcing self-financing in March 2016, the construction workers of railway projects must be Thai, and the buildings' raw materials must be produced domestically. However, China needs to provide technical support for railway construction projects.

In December 2011, six documents were signed, which included the high-speed railway cooperation memorandum from Bangkok to Chiang Mai and the 2015–2022 transportation infrastructure development plan. Since China and Thailand agreed on the high-speed rail cooperation project principle of Bangkok-Chiang Mai high-speed rail cooperation, more cooperation projects will be carried out. Hunan high-speed railway vocational and technical college undertook the cultivation of the cooperation. This project is mainly at Hunan high-speed railway vocational and technical college and Thailand vocational and technical college, which provide high-speed rail and rail transit professional personnel training. "1 + 1 + 3" learning is the training mode, the specific operation mode in Thailand, and aims to establish a cooperation foundation with Chinese colleges and universities. First, 1-year professional essential learning is required in Thailand, which includes language training (similar to the introductory class level), and then study at Hunan high-speed railway vocational and technical college. In addition, one year of professional study will be conducted in railway engineering construction technology, railway precision training, high-speed station maintenance, and related knowledge. The last three years in Thailand have been aiming for thesis completion and mutual recognition credits. Meanwhile, human high-speed railway vocational and technical college diploma, maha salad university bachelor's degree can be obtained.

## 1.2 Significance of the Problem

Therefore, the application of China-Thailand cooperation projects in high-speed rail and rail transit not only effectively solves the shortcomings of Chinese universities in conventional high-speed rail and rail transit education but also realizes the consistency of curriculum, teaching objectives, professional training in high-speed rail, and practical training. Furthermore, teaching extensively integrates domestic and foreign teaching resources and improves students' comprehensive ability of high-speed rail and rail transit. In this context, China and Thailand have made substantial progress in training high-speed rail and rail transit professionals, teacher sharing, and credit sharing. However, with the pandemic in 2020, the cooperation between China and Thailand has stopped for nearly two years. During the post-epidemic period, the main goal is to continue the Sino-foreign cooperation mode of high-speed rail and rail transit to meet the needs of both sides, deepen international education and teaching reform and Sino-foreign cooperation in running schools, shorten the distance between countries, between Chinese and Thai people, and between Chinese and Thai students, and strengthen mutual connectivity. More critical is conducive to enhancing the influence of China's vocational education, output for education globalization of Chinese vocational education standards, building with distinctive characteristics of Chinese vocational education communication system, enhancing the level of Chinese vocational education theory research, enhancing the

appeal of Chinese culture and the affinity of Chinese image, following the development trend of education globalization and regional integration.

### 1.3 Objective of the Research

The cooperative education mode of high-speed rail and rail transit was defined in this paper, which is based on talent training, teacher sharing, mutual recognition of academic qualifications of high-speed rail and rail transit majors, and academic issuance. High-speed rail and rail transit professional cooperation works as a carrier tool, mainly relying on government cooperation negotiations, sharing hardware conditions, and software sharing about high-speed rail and rail transit professional school teaching activities. From the history and culture, subjective, objective, and training mode, four key factors were defined in the high-speed rail and rail transit professional Chinese and foreign influencing factors.

## 2 Literature Review

Chinese-foreign cooperative education in running schools refers to the activities in which foreign legal person organizations, individuals, and relevant international organizations, together with Chinese educational institutions and other social organizations with legal status, jointly organize educational institutions mainly targeting Chinese citizens to implement education and teaching.

High-speed rail and rail transit major. It generally comprises high-speed rail and rail transit majors composed of high-speed rail engineering, rail engineering, operation management, and other majors, mainly for the direction of high-speed rail and rail transit.

School-running mode. The mode of running schools refers to the specific style of the system and mechanism of running and managing schools. The school-running mode is determined by the unique attributes and particular organizational structure of school-running resources.

Definition of the “1 + 1 + 3” school-running mode. Definition of the “1 + 1 + 3” education mode, Thai and Chinese universities establish a cooperation foundation, the first year of professional basic learning and language training in Thailand, which is similar to the introductory level. Then enter Hunan high-speed railway vocational and technical college for 1-year study, which includes railway engineering construction technology, railway precision training, railway station maintenance, and other related professional knowledge. The last three years in Thailand are for thesis completion and mutual recognition credits. Bachelor’s degree can be obtained from both Hunan high-speed railway vocational and technical college and Macan Salakan University.

## 3 Methodology

### 3.1 Scope of the Research

The study includes students and teachers who majored in high-speed rail and rail transit at Hunan High-speed Railway Vocational and Technical College and Thailand Waababong Vocational and Technical College.

### 3.2 Population and Sample

Five professional teachers were selected from Hunan high-speed railway vocational and technical college and Thailand. To carry out in-depth interviews, Thailand schools' in-depth interviews were conducted through networks and telephone. Two hundred sixty students were selected from Hunan high-speed railway vocational and technical college, and 50 were selected from Thailand vocational and technical college, and the questionnaire was distributed online.

This project employed Delphi technology and quantitative research methods to verify whether the recommended four factors of the school-running model can meet the requirements. The experimental data includes the influencing factors of Hunan High-speed Railway Vocational and Technical College and the four dimensions of history and culture, subjective, objective, and training mode of both China and Thailand. First, Delphi technology was employed for five experts' interviews, which concluded that the basis of the influence factors data. According to the primary data, the questionnaire was carried out in the questionnaire survey, and then the completed questionnaire-qualified questionnaire was selected. The length of the fixed influence factors was set to 10, with 20 students for a group of students to carry out the results. Each argument user was a unit, a set of 10 data, and a total of 5 rounds of results. The number of users successfully registered in the database system of the questionnaire is 325. Users with low questionnaire filling volume and those who did not complete the questionnaire were deleted through the system Settings and user filtering, and 100 valid users were selected. Combined with the actual situation and the investigator's resources, part of the data has been completed to form the data set of this article.

Based on the survey data, questionnaire participants with the low system setting filtering have been deleted, selected through the 100 investigators questionnaire, fixed the length of the influence factors set to 10, with 20, add 20, each two survey users for a unit group, a total of 5 rounds of data analysis, each test 10 times, the results are averaged. In this way, the factors affecting the sino-foreign cooperative education mode of high-speed rail and rail transit majors are verified with the increased offline number of users. The data applied accuracy as an evaluation criterion to measure the overall effect of the recommended method. Accuracy indices typically use f1 score values to reflect the quality of the index. It is the harmonic average calculated from the accuracy and recall. The former two are both considered. At present, this metric has been widely used the recommendation performance verification. Therefore, this study also used the f1-score values to evaluate the accuracy of the recommendations.

### 3.3 Conceptual Framework

1. Study models. The research model was constructed from the four factors affecting the Sino-foreign cooperative school model.
2. The "1 + 1 + 3" school-running mode of Sino-Thai cooperation in high-speed rail and rail transit major has been developed from the factors affecting the Sino-foreign cooperation in school-running mode (Figs. 1 and 2).

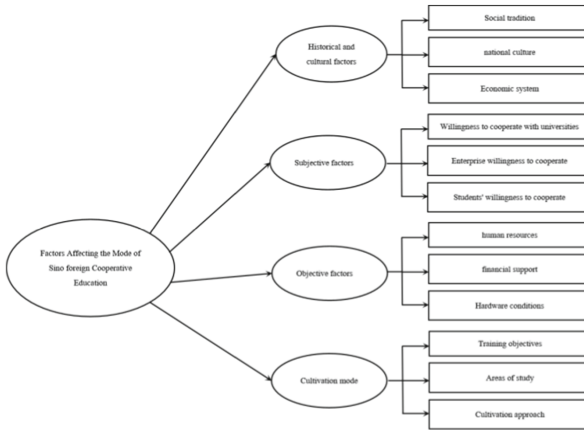


Fig. 1. Research model

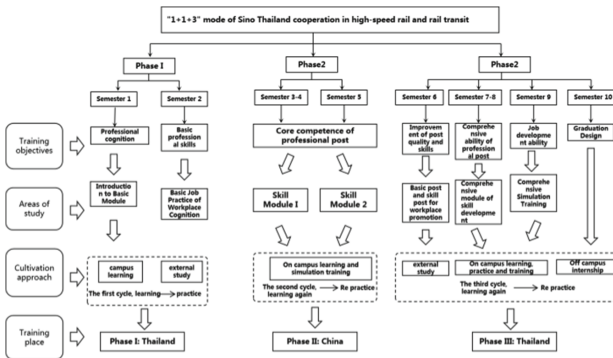


Fig. 2. "1 + 1 + 3" school-running mode

### 3.4 Hypothesis

According to the key factors affecting the school-running mode, four hypotheses were made in this study:

- H1: Historical and cultural factors will affect the Sino-foreign cooperative school-running mode of high-speed rail and rail transit majors.
- H2: Subjective factors will affect the Sino-foreign cooperative education mode of high-speed rail and rail transit majors.
- H3: Objective factors will affect the sino-foreign cooperative education mode of high-speed rail and rail transit majors.
- H4: The training mode factors will affect the Sino-foreign cooperative school-running mode of high-speed rail and rail transit majors.

**Table 1.** Factor results for the 20 users

Testing frequency	Historical and cultural factors	Subjective factors	Objective factors	Cultivation mode
1	0.8245	0.8079	0.7840	0.8237
2	0.8387	0.7983	0.7785	0.8387
3	0.8221	0.8096	0.7867	0.8264
4	0.8151	0.8065	0.7931	0.8155
5	0.8322	0.7957	0.8058	0.8310
6	0.8456	0.7846	0.7926	0.8418
7	0.8356	0.8013	0.7815	0.8356
8	0.8325	0.8028	0.7772	0.8322
9	0.8475	0.8009	0.7823	0.8462
10	0.8322	0.7982	0.7720	0.8333

### 3.5 Statistics

Delphi Technology Statistics selected five professional teachers from Hunan High-speed Railway Vocational and Technical College and Thailand Wabibatong Vocational and Technical College to conduct the in-depth interview. The in-depth interview in Thai schools was conducted via a zoom meeting or telephone call. Based on in-depth interviews, the influencing factors were made. Two hundred sixty students of high-speed rail and rail transit major from Hunan High-speed Railway Vocational and Technical College and 50 students from Thailand Waabtatong Vocational and Technical College were surveyed online. User filtering with low online questionnaires, incomplete information, and unable to score was deleted. Through the experimental analysis method, 20 student samples were taken as a group, each two survey users as a unit, a set of 10 data, a total of 5 rounds of demonstration of the results, adding 20 student samples in each round, and finally got the average of each influencing factor.

## 4 Results

The verification results of the design method on the data set were compared with the factors affecting the Sino-foreign cooperative education mode of high-speed rail and rail transit majors. Results for the factors affecting the 100 users are shown in Tables 1, 2, 3, 4, 5 and 6.

In the test of 20 users, the historical and cultural factors were 0.8306, 0.8005, subjective factors, objective factors 0.7853, and the training mode was 0.8324.

In the test of 40 users, the historical and cultural factors affecting the cooperative education mode of high-speed rail and rail transit majors were 0.7507, 0.7209 for subjective factors, 0.7006 for objective factors, and the training mode 0.8309.

**Table 2.** Factor results for the 20 users

Testing frequency	Historical and cultural factors	Subjective factors	Objective factors	Cultivation mode
1	0.7540	0.7134	0.7089	0.8211
2	0.7587	0.7268	0.7167	0.8321
3	0.7468	0.7186	0.7036	0.8228
4	0.7536	0.7243	0.7023	0.8174
5	0.7555	0.7115	0.6905	0.8310
6	0.7511	0.7301	0.6818	0.8425
7	0.7410	0.7227	0.7144	0.8311
8	0.7472	0.7155	0.7071	0.8322
9	0.7525	0.7292	0.6952	0.8462
10	0.7469	0.7166	0.6858	0.8331

**Table 3.** Factor results for the 60 users

Testing frequency	Historical and cultural factors	Subjective factors	Objective factors	Cultivation mode
1	0.7208	0.6845	0.6548	0.8113
2	0.7146	0.6787	0.6415	0.8255
3	0.7285	0.6764	0.6577	0.8132
4	0.7367	0.6851	0.6686	0.8117
5	0.7231	0.6815	0.6752	0.8215
6	0.7255	0.6646	0.6663	0.8650
7	0.7322	0.6573	0.6521	0.8589
8	0.7213	0.6725	0.6532	0.8350
9	0.7179	0.6858	0.6475	0.8158
10	0.7122	0.6892	0.6506	0.8123

In the test of 60 users, the historical and cultural factors affecting the high-speed rail and rail transit majors were 0.7233, the subjective factors were 0.6776, the objective factors were 0.6568, and the training mode was 0.8270.

In the test of 80 users, the historical and cultural factors affecting high-speed rail and ten majors were 0.7233, subjective factors were 0.6669, objective factors were 0.6568, and the training mode was 0.8257.

In the test of 100 users, the historical and cultural factors affecting high-speed rail and 100 users were 0.6862, subjective factors were 0.6287, objective factors were 0.6110, and the training mode was 0.8269.

**Table 4.** Factor results for 80 users

Testing frequency	Historical and cultural factors	Subjective factors	Objective factors	Cultivation mode
1	0.7205	0.6812	0.6558	0.8113
2	0.7146	0.6722	0.6425	0.8228
3	0.7285	0.6734	0.6577	0.8112
4	0.7367	0.6845	0.6678	0.8128
5	0.7231	0.6753	0.6728	0.8218
6	0.7255	0.6244	0.6678	0.8655
7	0.7322	0.6358	0.6568	0.8535
8	0.7213	0.6688	0.6522	0.8324
9	0.7179	0.6582	0.6415	0.8133
10	0.7122	0.6956	0.6535	0.8125

**Table 5.** Factor results for the 100 users

Testing frequency	Historical and cultural factors	Subjective factors	Objective factors	Cultivation mode
1	0.6943	0.6244	0.6058	0.8128
2	0.6822	0.6387	0.6228	0.8283
3	0.6765	0.6465	0.6135	0.8124
4	0.6822	0.6236	0.6111	0.8114
5	0.6853	0.6355	0.6068	0.8278
6	0.6916	0.6424	0.6028	0.8633
7	0.6949	0.6312	0.6122	0.8524
8	0.6875	0.6248	0.6213	0.8328
9	0.6754	0.6176	0.6025	0.8169
10	0.6921	0.6023	0.6116	0.8113

In the test of 100 users, the historical and cultural factors affecting the mode of Sino-foreign cooperative education in high-speed rail and rail transit majors were 0.7432, the subjective factors were 0.6989, the objective factors were 0.6821, and the training mode was 0.8285. It can be seen that the experimental results demonstrated that the influencing factors proposed here are consistent and correlated with the study hypothesis.



**Table 6.** Results for the influencing factors

Test Group	Historical and cultural factors	Subjective factors	Objective factors	Cultivation mode
20 investigators	0.8326	0.8005	0.7853	0.8324
40 investigators	0.7507	0.7209	0.7006	0.8309
60 investigators	0.7233	0.6776	0.6568	0.8270
80 investigators	0.7233	0.6669	0.6568	0.8257
100 investigators	0.6862	0.6287	0.6110	0.8269
The respondents mean	0.7432	0.6989	0.6821	0.8285

## 5 Discussions

Combined with the above studies, we can see that under the continuous development of high-speed rail and rail transit major in China and the prevalence of “high-speed rail fever” in Thailand, the China-Thailand cooperation project has made good progress in the past. In the next few years, it will be more necessary to combine the new situation of China’s education development and strive to carry out multi-dimensional systematic thinking on China-Thailand cooperative education to continuously improve and innovate from the concept and practical operation to the improvement of the level of China-Thailand cooperation.

1. Diversified development of cooperation models. Based on the influence of different social and cultural background factors between China and Thailand, China and Thailand have accumulated different educational characteristic resources in the development process of a college education. Therefore, China should pay attention to the diversified development of cooperation forms in the cooperation process between high-speed rail and rail transit central and Thailand. From the objective situation of Chinese universities and rail and rail transit professional teaching, combined with our university high-speed rail and rail transit talent resources, teaching system, related theoretical research in various aspects of advantage play, and joint research and development with Thai universities and signed various forms of high-speed rail and rail transit professional education cooperation form. For example, Hunan High-speed Railway Vocational and Technical College and Thailand Wabibatong Vocational and Technical College are the only schools in China to teach high-speed rail and rail, transit majors. Given the current curriculum setting, we should also consider the development of “1 + 1”, “1 + 1 + 2” mode, and Internet online courses to continuously promote the innovation of Sino-foreign cooperative school-running mode of high-speed rail and rail transit majors.

2. Establish an online international education and teaching platform with courses, teachers, and enterprises with practical practice and task-based teaching content as the clue. Online education and teaching platform are essential guarantees for training Sino-foreign cooperation and talent training. The curriculum system is the core connotation of talent training, teachers are the main body of talent training, and teaching practice

is essential to talent training. Teaching practice plays a role in testing, judging, and supervising the quality of talent training.

## 6 Conclusions

The results show that the historical and cultural factors strongly influence the school-running mode, while the subjective and objective factors are relatively weaker than the former, and the training mode is the most critical influencing factor. In the years of exploration and practice, the teaching mode of China and Thailand has gradually formed its own very distinctive curriculum system: the general education module is mainly based on the general railway situation and Chinese laws to realize its purpose of understanding the railway; The basic education module is the cultivation of the primary application ability of engineering mechanics and engineering measurement; the professional backbone education module mainly takes the study of high-speed railway and railway engineering construction technology, railway precision measurement, and the maintenance of high-speed railway stations, and cultivates their practical ability in different railway working environment; The professional elective teaching module mainly revolves around the history of railway development, high-speed railway introduction to high-speed rail and rail transit courses.

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