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On Intercultural Adaptability of Construction Vocational Education Students in the Context of "Belt and Road" Initiative and the Path of Enhancement

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Abstract This study takes the internationalization of the construction industry under the "Belt and Road" initiative as the background, focusing on the current situation of intercultural adaptability of students in construction vocational education and the path to improve it. Based on the school-enterprise cooperation model, a cultural education system was constructed. A multidimensional survey instrument was designed, and t-test and Pearson correlation were used to empirically analyze 500 valid samples. The results show that the average score of urban students in the dimension of intercultural awareness is 3.85±0.43, while that of rural students is 3.43±0.58 ($p<0.01$). In the intercultural attitude dimension, the mean score for urban students was 3.71±0.35, while for rural students it was 3.54±0.43 ($p<0.05$). The intercultural attitude dimension was slightly higher for engineering management students than for architectural design students ($p<0.05$). Intercultural awareness showed a significant positive correlation with intercultural attitude ($r=0.245$, $p<0.01$) and intercultural competence ($r=0.268$, $p<0.01$). Accordingly, strategies such as school-enterprise collaborative curriculum reform, mutual support mechanism for urban and rural students and emotional adaptation training are proposed to further promote the in-depth fit between the cultivation of intercultural resilience and industry needs.

Index Terms intercultural adaptability, t-test, Pearson correlation, school-enterprise cooperation model

I. Introduction

In the 40 years of reform and opening up, the development of China's construction industry has made remarkable achievements. In 2023, the total output value of the national construction industry reached 32 trillion dollars, a year-on-year increase of 5.8%, with 52.53 million employees, making it a veritable pillar industry of the national economy. Currently, the construction industry is in the midst of a comprehensive and superimposed transformation and upgrading of assembly, informatization, standardization, greening, and integration of design and construction, which has indeed reached a critical and sensitive stage of industrial modernization, and the construction vocational education is also undergoing changes [1]-[4].

In today's era, the world is facing great changes unseen in a century, and the new international environment of multi-civilization deep-seated games and the diverse and complex cultural environment along the "Belt and Road" are superimposed and intertwined, making the "Belt and Road" construction projects of Chinese enterprises in a complex cultural environment. To this end, as an early Chinese enterprise to implement the "going out" initiative, Chinese construction enterprises have actively responded to the national "Belt and Road" initiative, and launched an all-round exploration for the successful export of Chinese standards, Chinese manufacturing, and Chinese quality [5]-[8].

Since the 1960s, China's construction enterprises have signed hundreds of contracts for various overseas projects in more than 50 countries and regions in the world, covering almost all areas of the transportation infrastructure industry [9], [10]. However, according to the feedback of the project construction process, project communication barriers and landing delays caused by cultural differences such as religious taboos and customs account for 27% of the total completed projects [11]-[13]. It highlights the contradiction between the large-scale output of construction vocational education and the defective quality of education, of which low intercultural adaptability is one of them.

With the development of the "Belt and Road" initiative, people are facing more and more cultural differences, and if they do not have the ability of intercultural adaptation, they will feel confused and uncomfortable in the intercultural atmosphere [14]. As future leaders and social elites, college students should have the ability of intercultural adaptation to carry out various communication activities in the context of globalization and contribute to the

development of the country and the nation [15], [16]. It can be seen that in the context of “Belt and Road” Initiative, the intercultural adaptability of construction vocational education students is an important part of the promotion of multinational construction projects.

Taking construction vocational education students as the target, this study centers on the theoretical and empirical analysis of intercultural adaptability. First, the practical path is constructed through the school-enterprise cooperation model to explore the deep integration strategy of enterprise culture and vocational education. Secondly, we designed the intercultural adaptability survey framework and explained the principles of t-distribution and t-test. Stratified sampling and data collection are implemented, and the questionnaire survey and t-test analysis are combined to reveal the current situation of students' intercultural adaptability. Finally, through the difference analysis and correlation test, the influence mechanism of urban and rural origin, gender and other variables on resilience is revealed, and the targeted enhancement path is proposed.

II. Mode Construction and Practical Path of School-Enterprise Cooperation in Cultural Parenting

(1) School-enterprise co-construction of specialties and implantation of enterprise culture into the construction of specialties

The teaching team of each specialty builds the specialty together with the cooperating enterprises, and cooperates in formulating the curriculum standard, practical teaching plan and professional talent cultivation program. Through the construction of the specialty, the enterprise culture and professional spirit are infiltrated into all aspects of theoretical teaching and professional practice teaching, so as to improve the students' vocational skills through comprehensive training, cultivate their professional spirit of love and dedication as well as the craftsmanship of striving for excellence, and strengthen their sense of vocational identity and sense of professional ethics.

(2) School-enterprise co-construction of courses, so that enterprise culture can enter the classroom.

The teaching team of each major and the cooperative enterprises jointly design the high-quality courses and jointly write the school-based teaching materials, actively integrate the elements related to enterprise culture into the teaching content, combine the knowledge and skill requirements of the actual enterprise positions into the course standards and teaching content, plan the courses based on the actual projects and cases of the enterprises, and organize the students' learning in a targeted manner to improve the vocational qualities of the students.

(3) School-enterprise co-construction of teaching team, so that teachers can experience, absorb and spread enterprise culture

The school employs a group of professionals with senior management and technical background as part-time teachers from cooperative enterprises, formulates the “dual-teacher quality” teaching team training system, and regularly selects and sends teaching staff to enterprises for on-the-job training, so as to promote teachers to experience and absorb the advanced management concepts and excellent corporate culture of the enterprises while improving their practical teaching ability. Advanced management concepts and excellent enterprise culture can be taught to students.

III. Design of a survey on intercultural resilience of construction vocational education students

Under the dual background of the deep development of globalization and the high-quality promotion of the Belt and Road Initiative, China's construction industry is undergoing an unprecedented international transformation. The changes in the construction industry have put forward higher requirements for practitioners' intercultural adaptability, especially in the dimensions of docking technical standards, coordinating religious customs, and localizing project management. However, the current vocational education system is still characterized by the lack of cultural sensitivity training and weak intercultural practice teaching, which leads to the frequent occurrence of cultural cognitive bias triggered by students' professional adaptation dilemmas in overseas project practice. Most of the existing studies focus on the cultivation of language proficiency or general intercultural communication skills, but lack a systematic exploration of the cultural adaptation mechanism in the special context of the construction industry, and few of them are based on empirical data to build a localization enhancement path.

III. A. General design and implementation of the questionnaire survey

The main body of the questionnaire in this paper contains three dimensions: basic variables such as gender, grade, place of origin, and type of specialty are set in the module of demographic characteristics, and a combination of single-choice and multiple-choice is used. The intercultural adaptability measurement module is based on Berry's intercultural adaptation theory, and combined with the characteristics of the construction industry, 30 items are developed from four dimensions: intercultural awareness, intercultural emotions, intercultural attitudes, and

intercultural competence. Each item is scored on a 5-point Likert scale. In order to ensure the validity of the measure, the design of the questions has gone through three rounds of expert validation.

The implementation process adopted a stratified sampling method, based on the distribution characteristics of construction vocational colleges and universities in the provinces along the "Belt and Road", and selected 8 representative colleges and universities as the sample units, covering the two major categories of engineering management and architectural design.

III. B. Research methodology

III. B. 1) t-distribution and t-tests

As a more general distribution than the standard normal distribution, the probability density function of the t distribution is:

$$f(t)=\frac{\Gamma\left(\frac{v+1}{2}\right)}{\sqrt{v\pi}\Gamma\left(\frac{v}{2}\right)}\left(1+\frac{t^2}{v}\right)^{-\frac{v+1}{2}} \tag{1}$$

where $\Gamma(.)$ is the gamma function, this distribution has only one parameter, the degree of freedom v.

When $v\to\infty$, the t distribution is equivalent to the standard normal distribution. Therefore, the image of the probability density function of the t distribution is extremely similar to the standard normal distribution. A comparison of the probability density function image of the t distribution with the standard normal distribution is shown in Figure 1, where the solid line is the standard normal distribution, the dashed line is $v=10$, and the dotted line is $v=1$.

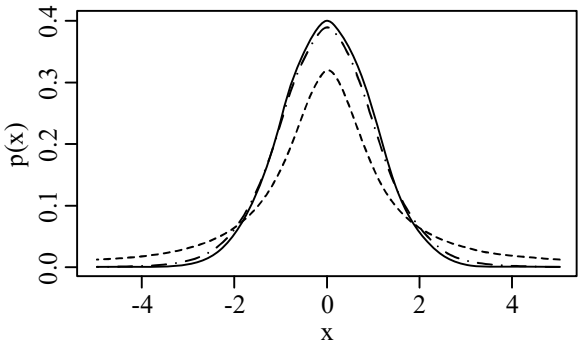

Figure 1: Comparison of function graphs

III. B. 2) Application of t-test

There are certain conditions for the application of the t-test. First, the t-test applies to test whether two samples are drawn from the same population. Second, the t-test requires that the variances of the two totals are equal, i.e., variance chi-squared. The application of the t-test in teaching is generally to take the students as a whole, when the overall expected grade, etc. should have only one mean. Teaching is divided into instructional groups using different teaching methods, and it is hypothesized that different teaching methods will change the expected student achievement. Create alternative hypotheses of a difference in achievement between groups and a null hypothesis of no difference between groups. Then use t test between groups.

IV. Research on the situation of intercultural adaptability of construction vocational education students and the path to improve it

Through the combination of online questionnaire platform and field distribution, 585 questionnaires were administered from March to May 2024, and 500 valid samples were obtained after excluding invalid data, with an effective recovery rate of 85.47%. All participants signed an informed consent form and were promised to be anonymized, and the questionnaire was set up with reverse scoring and polygraph questions to control the quality of responses, and the final data were standardized by SPSS 26.0.

IV. A. Analysis of variances

IV. A. 1) Gender

The results of the analysis of gender differences in intercultural resilience are shown in Table 1. The longitudinal comparison of the intercultural adaptability of students in construction vocational education revealed that there was

no significant difference between students of different genders in any of the four dimensions of the intercultural adaptability measure. The mean difference between male students in intercultural awareness (3.46±0.66) and female students (3.78±0.53) did not reach the level of statistical significance (p=0.389), although it showed a weak negative trend (t=-1.35). Intergroup differences in the intercultural affective dimension (3.17±0.28 for males and 3.31±0.33 for females) and the intercultural attitudes dimension (3.68±0.36 for males and 3.62±0.27 for females) similarly did not break the critical value (p>0.05). The intercultural competence dimension showed a weak gender convergence (3.62±0.45 for males and 3.65±0.38 for females, p=0.634), which is potentially relevant to the homogenization of technical competence requirements in the construction industry.

Table 1: Analysis Results of Gender Differences in Intercultural Adaptability

	Male (N=265)	Female (N=235)	t value	Significance
Intercultural awareness	3.46±0.66	3.78±0.53	-1.35	0.389
Intercultural emotion	3.17±0.28	3.31±0.33	-0.97	0.286
Intercultural attitude	3.68±0.36	3.62±0.27	0.33	0.731
Intercultural ability	3.62±0.45	3.65±0.38	-0.68	0.634

IV. A. 2) Grades

The results of the grade-level difference analysis of intercultural resilience are shown in Table 2. In the test of differences in intercultural resilience among students in vocational construction education, it was found that there was no significant difference between first-year and second-year university students in intercultural awareness, intercultural affect, intercultural attitude, and intercultural competence. The mean difference of the intercultural awareness dimension (3.74±0.72 vs. 3.52±0.66) did not reach the threshold of statistical significance (p=0.578) although it showed an effect size of 0.86. The intercultural competence dimension showed a weak negative grade difference (3.58±0.59 vs. 3.67±0.79, p=0.497), a phenomenon that may be related to adaptive fluctuations formed by the elevated difficulty of the major curriculum faced by sophomores.

Table 2: Analysis Results of Grade-level Differences in Intercultural Adaptability

	Freshman student (N=205)	Sophomore student (N=295)	t value	Significance
Intercultural awareness	3.74±0.72	3.52±0.66	0.86	0.578
Intercultural emotion	3.25±0.68	3.23±0.35	0.73	0.682
Intercultural attitude	3.69±0.71	3.63±0.92	0.38	0.771
Intercultural ability	3.58±0.59	3.67±0.79	-1.25	0.497

IV. A. 3) Place of birth

The results of the analysis of differences in intercultural resilience students' place of origin are shown in Figure 2. The data show that students from urban areas significantly outperformed students from rural sources on all dimensions of intercultural resilience. Specifically, urban students scored a mean of 3.85±0.43 on the intercultural awareness dimension compared to 3.43±0.58 for rural students (p<0.01). In terms of intercultural attitudes, the mean score for urban students was 3.71±0.35, while for rural students it was 3.54±0.43 (p<0.05). In the dimensions of intercultural affect and attitude, urban students scored slightly higher than rural students, but there was no significant difference. This suggests that the urban-rural difference in the place of origin has an important influence on the development of intercultural adaptability of construction vocational education students, which may stem from multiple factors such as more frequent exposure to multiculturalism, more balanced allocation of educational resources, and richer access to information for urban students.

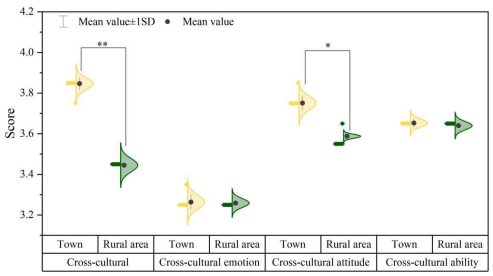

Figure 2: Analysis of differences in the source of intercultural adaptability

IV. A. 4) Specialization

The results of the analysis of differences in intercultural adaptability majors are shown in Figure 3. The scores of the two types of majors in the dimensions of intercultural awareness, intercultural emotion, and intercultural competence are similar, and the dimension of intercultural attitude is slightly higher for engineering management students than for architectural design students ($p<0.05$). This result reflects that the development of intercultural resilience in both engineering and architectural design is limited by professional background. However, although the statistical differences are not significant, the subtle differences in the development of intercultural competence among students of different majors should be paid attention to in the actual educational practice in order to provide more targeted training programs.

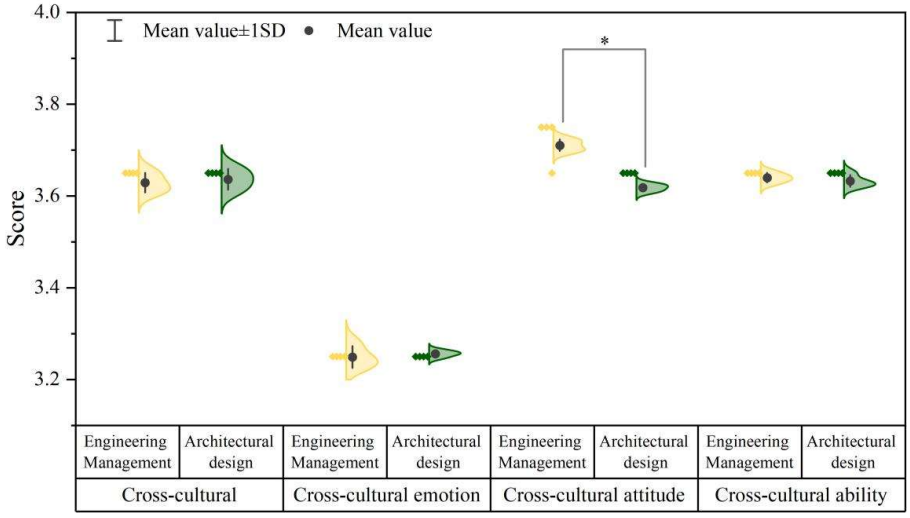

Figure 3: Analysis of professional differences in intercultural adaptability

IV. B. Correlation analysis

To further investigate whether there is a correlation between intercultural resilience, a Pearson correlation analysis resulted in a correlation matrix as shown in Table 3.

Intercultural awareness showed a significant positive correlation with intercultural attitude ($r=0.245,p<0.01$) and intercultural competence ($r=0.268,p<0.01$), suggesting that systematic knowledge of cultural differences contributes to the formation of positive cultural attitudes and provides a cognitive framework for the development of intercultural practical competence. The strength of the correlation between intercultural emotion and other dimensions is relatively weak, and it only maintains a weak significant correlation with intercultural attitude ($r=0.153,p<0.01$) and intercultural competence ($r=0.117,p<0.05$), which suggests that emotion regulation has not yet formed an effective transfer mechanism in the existing cultivation system.

Table 3: Pearson Correlation of Intercultural Adaptability

	Intercultural awareness	Intercultural emotion	Intercultural attitude	Intercultural ability
Intercultural awareness	1			
Intercultural emotion	.209*	1		
Intercultural attitude	.245**	.153**	1	
Intercultural ability	.268**	.117*	.196**	1

IV. C. Paths for improving intercultural adaptability

Based on the results of the survey, combined with the practice mode of school-enterprise cooperation and the demand for internationalized development of the construction industry, this paper puts forward the following paths to improve intercultural adaptability.

(1) Deepen intercultural curriculum and teaching reform through school-enterprise cooperation

Relying on the resources of cooperating enterprises, we set up overseas training bases in the countries along the “Belt and Road” and organize students to participate in overseas project research, technical assistance and other practices. Administrators and teachers of Chinese-foreign cooperative schools should strengthen communication and cooperation in teaching and management, establish a scientific and reasonable management system, and

improve the effectiveness of intercultural management. Building a cultural information sharing platform between schools and enterprises is also a suggested way. Teachers can take the form of co-construction through the network platform, build and share advantageous cultural courses with partner institutions, and realize the sharing of course resources through the channels of course openness and aerial classrooms. It is also possible to share teaching materials, excessive repetition of knowledge points, timely updating of information, and improvement of the accuracy and practicality of the content of teaching materials through the sharing of teaching materials. Professional teachers are required to participate in regular rotations in enterprises' overseas programs or go to overseas universities for intercultural education training, and the teaching of cultural adaptability is included in teachers' performance appraisal indexes.

(2) Strengthening adaptive support for rural students

Implement the intercultural competence twinning program for urban and rural students, organize intercultural learning groups between urban and rural students, and promote experience sharing through simulating overseas project scenarios. To address the shortcomings of rural students in terms of language ability and information channels, offer small language elective courses and provide dual-teacher interpretation services for overseas project cases.

(3) Strengthening emotional adaptation and cultural identity cultivation

Aiming at the weak intercultural emotional adaptation found in the survey, we introduce mental toughness training, culture shock coping strategies, etc., and alleviate cultural anxiety through role-playing and group sand table. Schools and enterprises jointly organize the “Belt and Road Architecture and Culture Festival”, inviting expatriate employees of enterprises to share their overseas work experiences and display the architectural arts and customs of the countries along the route, so as to enhance students' sense of multicultural identity. Encourage students to actively participate in intercultural activities, and set up related language and skills courses to help them understand society and culture and improve their language skills.

V. Conclusion

Based on the background of the Belt and Road, this paper launched a survey on intercultural adaptability for construction vocational education students, and proposed relevant intercultural adaptability enhancement strategies based on the results of t-test and correlation analysis.

There is no significant difference between students of different genders and grades in the four dimensions of intercultural adaptability. The average score of urban students in the intercultural awareness dimension was 3.85±0.43, while that of rural students was 3.43±0.58 ($p<0.01$). In the dimension of intercultural attitudes, the mean score of urban students was 3.71±0.35, while that of rural students was 3.54±0.43 ($p<0.05$). In the dimensions of intercultural emotions and attitudes, urban students scored slightly higher than rural students, but there was no significant difference. The scores of the two types of majors were similar in the dimensions of intercultural awareness, intercultural emotion and intercultural competence, and the intercultural attitude dimension was slightly higher for engineering management students than for architectural design students ($p<0.05$). Correlation analysis shows that intercultural awareness has a significant positive correlation with intercultural attitude ($r=0.245, p<0.01$) and intercultural competence ($r=0.268, p<0.01$), and the strength of the correlation between intercultural emotion and the other dimensions is relatively weak, which maintains only a weak correlation with intercultural attitude ($r=0.153, p<0.01$) and intercultural competence ($r=0.117, p<0.05$). 0.05) maintained only weakly significant associations.

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