Developing Inventory of The International Education Cooperation for Chinese College Students

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Abstract

This study was initially designed to develop and validate the international education cooperation inventory of Chinese college students, by conducting expert review and a survey of 91 Chinese students. In the first phase, an initial pool of 11 items were generated based on concept analysis and a literature review. Moreover, the content was validated and reviewed by international cooperation experts in the field of higher education. The evaluation in the second phase consisted of an item analysis and an exploratory factor analysis. Following the development process, one item was removed due to low discrimination after performing the item analysis, and the questionnaire was finalized with 10 in 2 dimensions, which are overseas and domestic international cooperations with acceptable reliability and validity. It was found that most of the participants completed the questionnaire without difficulty in about 1-2 minutes, it can be claimed that the IEC is an easy-to-use questionnaire that can be applied in future studies.

Keywords: international education cooperation inventory, Chinese college students, overseas international cooperation, domestic international cooperation

1. Introduction

Scholars have defined international cooperation in higher education differently at different times, but it is generally understood to be an outcome of internationalization (Chan, 2004 Hauptman-Komotar, 2019; Jaime et al., 2023; Shenderova et al., 2023), as most of the research of higher education cooperation has been based on a comparative analysis (Chan, 2004; Crossley & Watson, 2003; Phillips & Schweisfurth, 2014). Other research has proceeded to use case studys (Li & Ling, 2019; Lugovyy et al., 2017; Tan, 2019; Wang, 2020), whereas quantitative research in the field of higher education cooperation using scales as a tool, has received scant attention. There is a lack of tools for evaluating the level of international cooperation in higher education. As currently there is only an "Evaluation Scale of International Cooperation in Education" for school administrators (Hiroshima University, Center for the Study of International Cooperation in Education), an International Scale of Student Satisfaction (Zhong et al., 2012), and a China-US International Education Cooperation Student Questionnaire (Li et al., 2014).

The internationalization of education has been defined in countries' policy responses, an educational system, and university globalization. National policies especially have a significant impact on cooperation in education (Cho & Palmer, 2013). In addition to the influence of national policies and globalization, technological factors also support international cooperation (McPherson & Bacow, 2015), and it has also been promoted by the continual development of technology and popularity of online teaching (Bonvillian & Singer, 2013; Cho, 2012; Michile & Bacow, 2015). Many technologically-driven models, such as Edx, massive open online course (MOOC) and online teaching models, have been produced due to cooperation in higher education (Robson, 2018). These were applied and developed in the post-COVID-19 pandemic era (Bakhmat et al., 2021). Since it is clear that types and modes of international cooperation are becoming more and more diverse, more supplementary research and supports are needed to develop and update a new questionnaire for educational administrators to conduct a comprehensive assessment of the level of international education cooperation. Therefore, a scale that contains the types of international education cooperation (IEC) based on the literature was designed and used in this study to measure the level of international education cooperation.

2. Literature Review

2.1 Origin of the IEC Theory: Concept Proposition and Development

When the notion of internationalization first appeared in the business field, international business theory divided the internationalization of enterprises into two types: inward and outward (Welch & Luostarinen, 1993). The former realizes the internationalization of enterprises by cooperating with foreign enterprises, importing their franchising rights, etc., while the latter expands domestic business to foreign countries based on exports and investment. Inward internationalization can lead to outward internationalization, and vice versa (Fletcher, 2001). This classification idea has gradually become popular in the educational field. Xu (2023) divides education internationalization into inward and outward internationalization and Knight similarly divides higher education internationalization into domestic and overseas internationalization (Knight, 2008). The result of long-term development is that the discussion hotspot of education internationalization has gradually been replaced by education cooperation. In fact, international cooperation in higher education is not a new phenomenon. As Knight and de Wit (1995, pp. 6-7) , scholars argued for "to facilitate the mobility of students and scholars and the exchange of ideas".

International university cooperation has been on the agenda of governmental and it began to be perceived as an important aspect of educational and research processes (OECD, 2020), and since then, it has gained prominence as a significant university activity (Zahed, 2016). In recent years, universities have integrated international cooperation and international relations into their mission and function by assuming responsibility for cooperating with other institutions. However, developing international cooperation in university life, has often been a laborious process (OECD, 2020) that target various diverse elements. International cooperation among universities is one of many activities in a range of university activities, but it is not readily recognizable, which is mainly due to different views of its diverse elements.

2.2 Theoretical Development: Controversial Elements of International Educational Cooperation

The elements of International Educational Cooperation have still not been agreed upon by academic experts in the field. Czinkota and his colleagues divide the elements of internationalized education into the flow of students, teacher projects and institutions (Czinkota et al., 2009), while Oyler (2009) proposes that it includes elements such as recruiting international students, sending students abroad, the internationalization of courses, teacher research and communication, and the commitment of organizations to internationalization, etc. According to Xu (2023), international educational cooperation can be divided into the four types of mobility, namely, personnel mobility, project mobility, institutional mobility and standard mobility. The flow of personnel refers to students and teachers going abroad to study, However, Knight (2014) divides international education cooperation into five elements, including the mobility of the following five components (5 Ps);

A. People: teacher mobility e.g., hire foreign teachers, student exchange.

B. Programs: online course program e.g., MOOC, dual degree cooperation programs, overseas summer/winter camps.

C. Providers: Chinese-foreign cooperation in operating schools; Overseas internships.

D. Project services: overseas scientific research projects, overseas academic ability improvement projects, overseas social survey activities.

E. Policies: e.g., mutual recognition of credits, scholarship policy.

These five mobilities are the pillars of international education cooperation, and each of them has a unique form and conditions, leading to the formation of different cooperation models. For example, personnel mobility leads to the formation of an exchange student model, a dual degree model, and so on (Fabricius et al., 2017), and Chan (2004) suggests that mobility in the theoretical framework of higher education internationalization includes domestic and overseas mobility. Despite being currently recognized in academia, Knight's (2014) theory does not include the functions and influence of international cooperation, nor does it clearly compare better beneficial international cooperation modes.

Globalization has led to greater ties between regions and dependence among all countries (Teichler, 2004). Zahed (2016) argues that international cooperation in higher education has three components, namely, country, colleges and universities, and individuals i.e. teachers and students. Mobility is the area par excellence in which universities incorporate international cooperation into their activities. International education cooperation is often associated with actions that are intended to strengthen the capacity of individuals and organizations, by providing beneficiaries with a wide range of opportunities. Zahed (2016) defines the elements of international education cooperation as follows;

A. Education cooperation—student, expert and teacher exchange, language learning, joint degrees and the development of international curricula.

B. Research cooperation—undertaking joint research activities.

C. Training cooperation—developing training programs and supplying training equipment and materials.

D. Cultural cooperation——designing development-orientated social and cultural programs, and

E. Scholarships.

It is clear that based on Zahed's theory (Zahed, 2016), educational collaboration includes student, expert and teacher exchange, language learning, joint degrees, and the development of international curricula and that collaboration in short-term training programs and academic programs is for research and training, not education. However, research and training are inseparable from higher education (Knight, 2018). It is hard to separate research, training and education at the doctoral, master and undergraduate stages (Knight, 2014). Therefore, contrary to agreeing with Zahed (2016) that international education cooperation should exclude joint research activities and the development of training programs, Knight's five elements of international education cooperation were used in this study as a theoretical basis of a 10-question "International Education Questionnaire" based on the themes described below (Knight, 2008).

Students' experience of participating in "long-term study abroad", "short-term overseas study", "overseas winter/summer camps", "language classes in foreign schools", "overseas academic ability improvement" project, "overseas short-term scientific experiments/social surveys", "overseas internships", "foreign teachers from partner institutions to offer offline courses/lectures" in your home country, "online series courses/lectures of foreign partner universities" during the epidemic, and "using online learning on international course cooperation platforms such as MOOC" in China (Despujol et al., 2022; Feng, 2021; Wang & Li, 2022; Yu, 2020).

2.3 Theory Construction and Innovation

Some of administrators consider international education cooperation to be an unnecessary expense, an obligation, or an activity undertaken purely for prestigious reasons. Despite these negative views, an increasing number are beginning to successfully incorporate international cooperation in their institutional structure (Zahed, 2016). Zahed (2016) identifies students, experts, teachers, volunteers, administrators and academic exchanges as the main components of international education cooperation in universities. This entails students living and studying abroad to experience multiple cultures. The experience students acquire by studying abroad is different from studying in their home country and acquiring it by travelling or making short visits, which merely provide a superficial introduction to new cultures due to their nature and short duration (Zahed, 2016).

Developing students' awareness and understanding of different perspectives, outlooks and cultures is of prime significance in properly equipping and preparing them with the knowledge and skills required to meet the needs of today's globally-connected world (Carlson,1988; McCabe, 2001). Studying and living abroad is one of the ways to arouse students' cultural awareness based on extensive interaction with members of a foreign culture (Leung, 2008). Zahed (2016, p. 150) defines study abroad programs as "educational programs that occur in a foreign country outside the country of origin or citizenship, that offer students the opportunity to earn knowledge through academic credits or degrees through international experience".

Some researchers have found that individuals who study abroad demonstrate an increased interest in travel, art, foreign languages, history and architecture, which enhances their assessment of aesthetics (Fukuda & Nishikawa, 2021; Pipitone M., & Raghavan, 2022). This is one of the frequently-cited characteristics of creative individuals (Barron & Harrington, 1981; MacKinnon & Hall, 1971). Based on Barron's research, Zahed (2016) agrees that students will have a multicultural experience by studying overseas due to education internationalization, which will enhance their creative thinking. However, since Zahed's (2016) theory of higher education internationalization emphasizes going abroad, its focus is only international cooperation methods overseas, while it ignores domestic cooperation methods.

Similarly, although Knight (2014) observes that domestic internationalization is based on "mobility", her theory lacks systematic research on domestic international cooperation, because she uses "mobility" as a theoretical cornerstone to propose that the pillars of international education cooperation consist of the mobility of five elements, namely, people, programs, providers, project services and policy (Knight, 2014). However, it is no longer adequate to define the internationalization of higher education in terms of "mobility" (Robin, 2001), because the types of providers of higher education and the methods of delivering it have now been developed, which means that students no longer

need to travel abroad. They can participate in web-based courses at institutions that are in partnership with those in other countries supported by internet technology in what is called domestic internationalization (Chan, 2004; Knight, 2008).

In summary, the advantage of Knight's (2014) theory is that it recognizes the boundary between domestic and overseas internationalization, while its disadvantage is that it ignores the potential impact on students' creativity of multiculturalism in international educational cooperation (Killick, 2017). In terms of Zahed's (2016) theory, although it does focus on the potential impact, it is limited to a group of students studying abroad, while it ignores the new forms of domestic cooperation under the backdrop of the digital era (Singh & Yi, 2020). Hence, it is insufficiently comprehensive to develop international education cooperation assessment questionnaire. Therefore, a new theoretical framework will be built in this study based on the theories of international education cooperation of Knight (2014) and Zahed (2016), taking care to pay equal attention to domestic international cooperation and overseas international cooperation.

Knight's (2014) theory of international educational cooperation with its five elements of mobility will be utilized to design a questionnaire for this study, with questions related to both domestic and overseas international cooperation, in order to construct "a theory of international cooperation in higher education".

As indicated in Figure 1, not all students need to go abroad for international education cooperation. Schools can use domestic internationalization, which involves employing excellent foreign professors and equipment, attaching importance to foreign language teaching, and introducing foreign learning methods in order to enhance their level of internationalization. Overseas internationalization refers to multicultural education, which requires students to go abroad to be educated in foreign schools (Fabricius et al., 2017). Dual degrees and student exchange programs are the two most common modes of cooperation.

Based on this framework, students who had studied abroad and had experience of international education cooperation were deemed to have had access to a combination of intellectual resources in various cultural contexts to enable them to solve problems and generate ideas that were richer in description, detail and humor than those generated by students in the other groups, including the group who were planning to study abroad (Benet-Martinez et al., 2006). The theoretical mechanism of this study involves establishing measuring dimensions to comprehensively develop international education cooperation based on all the relevant activities in the era of digitalization and globalization by dividing it into local international education cooperation and overseas international education cooperation.

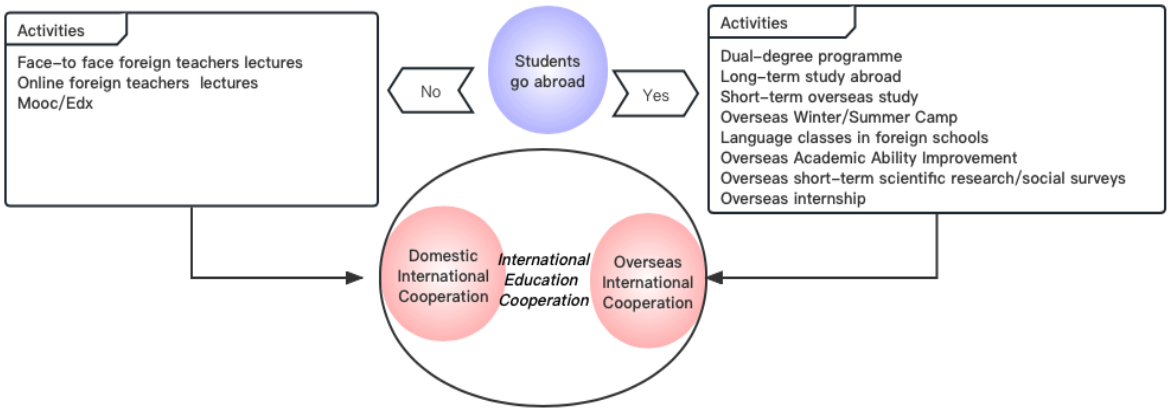

Figure 1. Theoretical Framework

Note: This figure shows that the theory of international cooperation can be divided into domestic cooperation and overseas cooperation i.e. going abroad. Domestic cooperation means that students do not need to go abroad, while overseas cooperation refers to multicultural education, which requires students to go abroad to be educated in foreign schools.

2.3.1 Domestic International Cooperation

Students who engage in domestic international cooperation have no experience of going abroad and only participate in offline courses and lectures offered by foreign teachers from partner institutions in their homeland, or in a series of online courses provided by foreign partner institutions, or courses on international platforms (Chan, 2004). There are two main forms of domestic and international cooperation: one is course mobility (online courses, MOOCs), and the other is teacher mobility (hiring foreign teachers from partner institutions to teach students in China).

(1) Teacher Mobility

The process of international cooperation in operating schools in China generally entails domestic teachers teaching basic courses, and foreign teachers teaching foreign languages and instructional courses with professional characteristics. This model also has multiple benefits for students' learning (Liu, 2020). Firstly, from a professional perspective, English is the first language of most foreign teachers, and their standard pronunciation is conducive to cultivating students' listening and speaking skills and the English way of thinking. In addition, foreign teachers' courses are conducive to cultivating students' multicultural thinking, and also conducive to the students' indirect acquisition of a multicultural experience (Liu, 2020).

However, some scholars believe that the random assignment of foreign teachers due to their high mobility is a significant shortcoming of this international cooperation model because it results in different teachers teaching the same courses every year. Moreover, as the duration of most international education cooperation courses is about 36-48 hours, and most foreign teachers at cooperative colleges who teach courses abroad come to China to teach during their holiday period, the majority of courses need to be completed within 4 weeks, which is too intensive for students to absorb much knowledge (Yang, 2013).

(2) Course Mobility

Internet technology provides many interesting platforms for the cooperation of higher education institutions to use to improve students' learning experience (Martín-Blas & Serrano-Fernández, 2009). While it used to be difficult for students from under-developed and developing countries to cooperate in international higher education in the past (Chan, 2004), the recent development of online techniques and online open education, such as Edx and MOOCs, have proven to be extremely popular with students from both these types of countries (Barthakur et al., 2021).

In the context of network technology and the marketing of education, cooperation models such as edX and MOOC have become a popular form of education cooperation. When edX was first launched, it triggered the operation of a number of MOOC providers, such as Coursera and Udacity, making edX part of a group of innovations in the MOOC domain. From the outset, edX aimed to offer large-scale, quality education with unprecedented access (Voigt et al., 2017) by ensuring that MOOCs were open to all people who were interested in learning anywhere in the world to participate in free online courses (Al-Rahmi et al., 2019). MOOCs can be identified as aggregate classes from many institutions, universities and schools, which collaborate on a digital platform (Joksimović, et al., 2018).

However, some researchers have claimed that this cooperation model lacks supervision (Al-Rahmi et al., 2019; Zheng et al., 2018), cannot impose strong constraints on students, and the quality of the education cannot be guaranteed. Ultimately, the pass rate of courses is lower than that of offline courses and the sense of a multicultural experience is low (Zheng et al., 2018).

Due to the internationalization and marketisation of education, higher education has become a special industry where public welfare attributes and commodity attributes co-exist (Liu, 2020). Treating higher education as a commodity attracts international competition, accompanied by cooperation (Knight, 2014; Kirby, 2018). Therefore, attention needs to be paid to strengthening the supervisory mechanism of cooperative online courses, such as edX and MOOC (McGee, 2014) because quality is the foundation of guaranteeing international education cooperation.

2.3.2 Overseas International Cooperation

Overseas international cooperation emphasizes overseas experience with students participating in domestic and foreign dual-degree programs, long-term overseas study, short-term overseas study visits, overseas summer/winter camps, language classes/language training programs in foreign schools, overseas academic ability improvement courses, and overseas short-term scientific research experiments/social surveys, overseas internships, etc. (Chan, 2004; Knight, 2014).

Students choose the "dual-degree" cooperation model to study in a foreign partner institution for one academic year or more and graduate with degrees from the domestic and foreign university (Fabricius et al., 2017). In contrast, students' study time abroad is greatly shortened in the "long-term study abroad" cooperation model and they only

need to study and exchange for more than one semester (Velliaris & Coleman-George , 2016).

The “Overseas Winter/Summer Camp” is one of the most popular cooperation models, when students choose to go overseas during their winter and summer vacations for a cultural experience and learning exchange organized by domestic and foreign universities (Jowi., 2009). Increasing numbers of Chinese students are demanding a linguistic environment in which they can improve their language skills, which is why the "language classes in foreign schools" model has been attracting attention since 2010 (Fabricius et al., 2017). An excellent study tour program should enable students to deeply integrate into the lives of the local community and ordinary residents, stay at the chosen study destination for at least two weeks, and eat and live with the locals to obtain a multicultural experience (Jowi., 2009). "Language classes in foreign schools" are defined as students going overseas to participate in language courses and teaching activities abroad offered by the school's foreign partner institution (Fabricius et al., 2017).

In addition to educational cooperation programs for language proficiency, there is also a growing number of programs based on enhancing Chinese college students’ academic ability. These are so-called "overseas academic ability improvement”, “overseas short-term scientific research and experimental project cooperation" and "overseas short-term social survey project cooperation", which refer to students going overseas to participate in experimental projects, scientific research projects, and social survey activities jointly established by the school its and foreign partner university (Daddi & Zhu, 2008; Fabricius et al., 2017).

Employers’ increased emphasis on work experience due to the enhanced pressure caused by employment competition in the market has led to the emergence of "overseas internships" where students can take advantage of the opportunities jointly offered by the school and foreign institution to accumulate their experience by participating in internships in foreign countries (Toncar & Cudmore, 2000).

3. Methods

3.1 Research Procedure

The first step of the research involved using the IEC theory derived from Zahed (2016) and Knight (2008) as the research basis from a review of the literature on international cooperation in the educational field. The measure of international higher education cooperation included both domestic and overseas cooperation.

The second step entailed searching the literature for information on domestic and overseas international cooperation and summarizing the specific cooperation methods and activities in this field.

In the third step, the validity of developed international education cooperation questionnaire (IEC questionnaire) was reviewed by the expert panel, who are five scholars and administrators in the field of international cooperation programs. Each expert had more than five years of experience of international cooperation in higher education, and each response on international education cooperation was reviewed independently on a 3-point Likert scale (1=agree, 2=need revision, 3=disagree).

3.2 Participants

Knopf et al. (2008) propose that, when the nature of the pilot subjects should be the same as that of the subjects to be selected in the formal questionnaire, the number of pilot subjects should be 3-5 times the number of the "subscale" that contains the most items in the questionnaire (Gay & Airasian, 2000). Since the participants of this study are college students, the pilot subjects are also college students and the international education questionnaire has 11 items, the number of pilot objects should be 33-55 students (Gay & Airasian, 2000). A total of 91 Chinese students involved in this study, which meet the sample requirements based on statistics’ criteria.

In the expert review stage, according to the research of Leite et al. (2018), at least five experts should review the constructed questionnaire to produce content validity, hence, a total of five experts involved in this study, all of them had over 5 years’ experience in higher education cooperation. including a director and three staff of the international exchange office of a university in China and a post-doctoral fellow, who is a British higher education interdisciplinary researcher.

3.3 Item Generation

The design procedure was as follows. The first step was to review the literature on international cooperation in the educational field using the theory of IEC derived from Zahed (2016) and Knight (2008) as the research basis. An electronic search of Scopus, Web of Science, SAGE and JSTOR was undertaken using the keywords, evaluation, measurement, ‘concept’, international cooperation, higher education, activities, overseas cooperation program, domestic cooperation programs. Several articles were retrieved to enable the development of the concept of international cooperation, summarize specific activities and generate items for the questionnaire based on the

activities of cooperation programs. The measure of international higher education cooperation included domestic and overseas cooperation.

The second step was to search the literature for information on domestic and overseas international cooperation and summarize the cooperation methods and activities in this field. The summarized items were verified by experts from the university international cooperation office. A total of 11 types of activities were examined in an international education cooperation questionnaire (see Table 1), which included two dimensions. Q 1 to Q8 were related to overseas international cooperation based on long-term cooperation and short-term cooperation, while Q9 to Q11 were intended to address domestic international cooperation based on teacher mobility and course mobility. The questionnaire was designed in the form of a 5-point Likert scale (5= highly engaged, 4= engaged, 3= neutral, 2= less engaged, 1 = never engaged). The higher the score of a question suggests the higher the popularity and acceptance of this international educational cooperation program, which is helpful for education administrators to evaluate the participation degree of Chinese college students in international education cooperation, and to analysis the current status of international education cooperation.

The third step was to conduct an expert review to check the validity of the international education questionnaire based on 5 anonymous experts, each of whom was given 11 questions to score. Each expert had more than 5 years of experience of international cooperation in higher education. Each response on the international education cooperation was expressed independently on a 3-point Likert scale (1=agree, 2=need revision, 3=disagree) based on the experts' experience.

Table 1. International Education Cooperation Questions

No	Items
Q1	During your learning journey, kindly assess the extent of your involvement in a "dual degree program".
Q2	During your learning journey, kindly assess the extent of your involvement in "long-term study abroad".
Q3	During your learning journey, kindly assess the extent of your involvement in "short-term overseas study".
Q4	During your learning journey, kindly assess the extent of your involvement in an "overseas winter/summer camp".
Q5	During your learning journey, kindly assess the extent of your involvement in "language classes in foreign schools".
Q6	During your learning journey, kindly assess the extent of your involvement in the "Overseas academic ability improvement" project.
Q7	During your learning journey, kindly assess the extent of your involvement in "overseas short-term scientific research experiments/social surveys".
Q8	During your learning journey, kindly assess the extent of your involvement in an "overseas internship".
Q9	During your learning journey, kindly assess the extent of your involvement in "foreign teachers from partner institutions' offer of offline courses/lectures" in your home country.
Q10	During your learning journey, kindly assess the extent of your involvement in the "online series of courses/lectures of foreign partner universities" during the epidemic.
Q11	During your learning journey, kindly assess the extent of your involvement in "using online learning on international course cooperation platforms such as MOOC" in China

Note. Items=11.These are the items of the international education cooperation questionnaire built for this research

3.4 Content Validity

To accurately reconstruct the scenarios faced by Chinese university students when exploring international education cooperation, the questions were assessed using a content validity test based on experts' opinions before the scale and questions were determined. The questionnaire and questions were reviewed by experts, to ensure that the questions in the questionnaire could be used to collect the required information effectively (Sürücü & Maslakci, 2020).

The collection of the expert review was completed in 2022 and a total of 11 items were reviewed by 5 experts. The 95% confidence interval of Fleiss' Kappa was 0.540 to 0.665, the overall Kappa was 0.602>0.6, it was acceptable (Altman,1999; Di Eugenio & Glass, 2004; Fleiss,1971; Fleiss et al., 2003; Sheskin, 2011); and the Cronbach's α was 0.822, the internal consistency was good (Nunally & Bernstein,1978; Wortzel, 1979).

Sapsford and Jupp (1996) define a pilot test as a test conducted on a small sample before a formal survey to measure the suitability of the questions in the measurement instrument. Hence, the pilot test in this study aimed to test the reliability and validity of the questionnaires. After the expert review, a pilot test was conducted online by the "Wenjuanxing Platform" from 5th July, 2022 to 19th July 2022. The participants were informed consent, also were assured that their answers would remain anonymous.

4. Results

According to Chen (2010), it is essential to subject the data-collection tool to a pilot test, whether it is a questionnaire or interview (Chen, 2010). The pilot test in this study aimed to test the reliability and validity of the questionnaire; therefore, after the expert review, it entered the pilot phase.

A total of 120 questionnaires were distributed for the test, which was conducted at Huaqiao University, Xiamen City, Fujian Province. 97 questionnaires were returned, 91 of which were valid, representing a 93.81% valid return rate. 35 participants (38.46%) were male and 56 (61.54%) were female. 23 (25.27%) of them were undergraduate students, 44 (48.35%) were postgraduate students, 23 (25.27%) were doctoral students, and 1 (1.10%) was a post-doctoral fellow. Their age groups were 15-20, 21-25 and 35-40, length of overseas stay was less than 6 months, 6 months-1 year, 1-2, 2-3, 3-4, 4-5, and more than 5 years), 7 majors, and 23 locations.

4.1 Item Analysis

An item analysis was used in this study to determine the validity and suitability of each item of the questionnaire. The analysis items were summarized, and then divided into high and low groups (bounded by the 27% and 73% quantiles), and then a t-test was used to compare the differences between the high and low groups. A difference indicated that the design of the scale item was appropriate, while no difference indicated that the scale item could not distinguish the information, and that the design should be deleted if it was unreasonable. An important evaluation indicator for the project analysis was that a CR value higher than 3 meant good discrimination (Carmines & McIver, 1981). Meanwhile, the difficulty of the test questions had to be controlled between 0.2-0.8. The difficult question should be close to 0.5, below 0.2 would indicate that the question is too difficult, and above 0.8 that the question is too easy (Colomo-Palacios, 2013).

In terms of the international education cooperation questionnaire, it can be seen from Table 2 below that, although the Cronbachs'α and value of difficulty to Q3 met the criteria, the CR values of Q3 did not meet the statistical reference criteria which should have been higher than 3 (Landau & Everitt,, 2003); hence, Q3 was rejected. The other questions had good discrimination, and the overall difficulty remained low to medium.

Table 2. Results Of an Item Analysis of International Education Cooperation Questionnaire

Questions	Cronbach's alpha	Discrimination(CR)	Difficulty	Decisions
Q1	0.876	11.568	0.442	Selected
Q2	0.889	6.718**	0.462	Selected
Q3	0.877	2.826**	0.555	Rejected
Q4	0.877	14.437**	0.557	Selected
Q5	0.878	34.069**	0.476	Selected
Q6	0.879	19.715**	0.476	Selected
Q7	0.876	27.743**	0.538	Selected
Q8	0.874	46.334**	0.538	Selected
Q9	0.878	14.327**	0.476	Selected
Q10	0.912	12.437**	0.692	Selected
Q11	0.935	3.566**	0.616	Selected

Note. n=91.**p<0.01. Items of the international cooperation questionnaire built for this research.

4.2 Factor Analysis

In order to further determine if the questions in the questionnaire were reasonable, a factor analysis was used to analyze their validity, and a comprehensive analysis was conducted of the Kaiser-Meyer-Olkin (KMO) value, common degree and the variance explained rate value, respectively. The KMO value was used to judge the suitability of the information extracted (Kaiser,1970), and the common variance was used to exclude unreasonable research items. The cumulative total explained variance was used to show the level of information extraction (Yong & Pearce, 2013; Williams et al., 2010), the factor loading coefficient was used to measure the corresponding relationship between factors and items, and Cronbach's alpha was used as an evaluation index for a reliability analysis (Nunally & Bernstein, 1978; Wortzel, 1979).

The data in this study was rotated using the maximum variance rotation method (varimax) in order to find the relationship between the factors and study items. Table 3 shows the information extraction of factors for the research items, as well as the corresponding relationship between them. Based on the results of the factor analysis of the international cooperation questionnaire, the items of international cooperation were divided into two dimensions, namely, domestic and overseas, and were consistent with expectations.

Table 3. Results Of a Factor Analysis of International Education Cooperation Questionnaire

Items	Factor loading		Common variances
	1	2	
Factor 1: overseas cooperation			
Q8	0.977	-0.140	0.893
Q7	0.950	-0.132	0.895
Q4	0.946	-0.206	0.937
Q5	0.946	-0.021	0.891
Q6	0.944	-0.029	0.921
Q3	0.907	-0.083	0.380
Q2	0.813	-0.128	0.845
Q1	0.632	-0.192	0.904
Factor 2: domestic cooperation			
Q9	0.225	0.891	0.436
Q10	0.233	0.891	0.678
Q11	0.195	0.481	0.462

Note. n=91. Items of the international cooperation questionnaire built for this research. The extraction method was a principal axis factoring with an oblique (ProMax with Kaiser normalization) rotation.

The results of evaluating the pilot test responses to the International Education Cooperation Questionnaire based on reference statistical standards were that KMO was 0.612>0.6, Cronbachs' alpha was 0.602>0.6 (Wortzel,1979), and the cumulative total explained variance was 57.272%>50% (Yong & Pearce,2013; Williams et al., 2010). However, the common variances of Q3,“Your experience of participating in "short-term overseas study" was 0.380. As this was less than 0.4, it indicated that information about this research item could not be effectively expressed (Kaiser,1970); hence, Q3 was deleted. Although the factor loading of Q11 was 0.481, which was lower than 0.6, Guadagnoli and Velicer (1988) claim that a factor loading greater than 0.4 is acceptable; hence, Q 11 was retained.

It was found from the second round of data analysis after deletion that the common variances corresponding to all the research items were higher than 0.4, indicating that the information of the research items could be effectively extracted. As shown in table 4, the KMO value had increased from 0.612 to 0.697 (Kaiser,1970), the cumulative variance explanation rate after rotation had increased from 57.272% to 89.792% (Yong & Pearce, 2013; Williams et al., 2010), and the factors (domestic, overseas) also matched expectations, indicating better reliability after deleting Q3 (Nunally & Bernstein, 1978; Wortzel, 1979). Besides, after deleting Q3, the questionnaire also had better validity (Cronbach's alpha was 0.902> 0.602)

Table 4. Factor Analysis Summary of International Education Cooperation Questionnaire

Phase	KMO	Cronbach'α	Cumulative total explained variance after rotation
Before deleting	0.612	0.602	57.272%
After deleting	0.697	0.902	89.792%

5. Discussion

The aim of this study was to design a tool to measure international cooperation in higher education using a questionnaire that was developed based on theory, projects, expert opinions obtained from qualitative research, and an extensive review of the existing related literature. The questionnaire was designed to include a wide range of items to assess various activities associated with international education. After completing the validity and reliability stages, the International Education Cooperation Questionnaire (IEC) consisted of 10 items and 2 dimensions. These dimensions included overseas international education cooperation and domestic international education cooperation, a total of two measurement standards. Since most of the participants completed the questionnaire without difficulty in about 1-2 minutes, it can be claimed that the IEC is an easy-to-use questionnaire that can be applied in future studies.

Overseas international education cooperation, which emphasizes overseas experience, was the first factor of the current inventory. This included students participating in double degree programs, long-term overseas study, short-term overseas analyses, overseas summer/winter camps, language classes/language training programs in foreign schools, overseas academic ability improvement courses, short-term overseas scientific research experiments/social surveys, overseas internships, etc. (Chan, 2004; Knight, 2014). The results showed that overseas international education cooperation expands students' opportunities to participate in international education (Crossman & Clarke, 2010). Establishing international educational cooperation helps educational institutions to build and strengthen global partnerships and networks (Sanders & Wong, 2021), providing opportunities for joint research. Governments, educational institutions and organizations can establish bilateral or multilateral agreements to facilitate overseas international education cooperation (Robson & Wihlborg, 2019), formulate funding mechanisms, and create networking and knowledge-sharing platforms (Janus, 2016). They can also support initiatives that promote the internationalization of education and encourage institutions to engage in collaborative activities (Ramaswamy et al., 2021).

Domestic international cooperation was the second factor of the current inventory. This consisted of three items: face-to face foreign teacher course, online foreign teacher course, and MOOC/EdX. Students who choose domestic international cooperation have no experience of going abroad and only participate in offline courses and lectures by foreign teachers from partner institutions in their homeland, or a series of online courses provided by foreign partner institutions, or courses on international platforms (Chan, 2004). In the digital age, universities tend to pay more attention to models of domestic international cooperation, especially online international education, particularly in the context of COVID-19. While it is true that Internet technology provides many platforms, such as MOOC and edX, for the cooperation of higher education institutions, education managers need to be aware of the lack of supervision of domestic cooperation projects in the online cooperation mode (Al-Rahmi et al., 2019; Middlehurst, 2001; Zheng et al., 2018). Even if the very best foreign teachers are recruited at the beginning of an online cooperative course, the quality of teaching cannot be guaranteed throughout the course because the network cannot impose strong constraints on the students' behavior. In the end, further evidence is required, because the pass rate of online courses is currently lower than that of overseas international cooperation programs. This finding suggests that university administrators need to be aware of management loopholes.

6. Conclusions and Limitations

The initial objective of this study was to develop and validate an international education cooperation inventory for college students in China. Following the development process, one item was removed due to low discrimination after performing the item analysis, and the questionnaire was finalized with 10 in 2 dimensions, it was found that most of the participants completed the questionnaire without difficulty in about 1-2 minutes, it can be claimed that the IEC is an easy-to-use questionnaire that can be applied in future studies.

However, the most important limitation of this study was its focus on students and administrators at the international exchange office for international education cooperation, while teachers, who play an extremely important role in this field, were ignored. Hence, it is recommended that future researchers include teachers in their study, in order to update the international education cooperation questionnaire based on teachers' experience of teaching in this

environment (Blaschke, 2021). In fact, it is necessary to further discuss the reform and new trend of international cooperation in China's higher education with both teachers and students. Besides, the sample size for this study was limited because the data was collected during the COVID -19 epidemic.

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