Applied Mathematics and Nonlinear Sciences

<https://www.sciendo.com>

Research on Evaluation of Intercultural Competence of Civil Aviation College Students Based on Language Operator

Jin Wang^{1,†}, Chuan Liu^{2,‡}, Li Zheng^{1,§}, Maozhu Jin^{2,¶}, Nympha Rita Joseph^{3,||}¹ School of Foreign Language, Civil Aviation Flight University of China, Guanghan 618307, China² Business School, Sichuan University, Chengdu 610064, China³ Department of Accounting and Finance, Faculty of Administrative Sciences, Applied Science University, Al Eker, Kingdom of Bahrain

Submission Info

Communicated by Juan Luis García Guirao

Received April 12th 2021

Accepted July 7th 2021

Available online July 27th 2021

Abstract

The latest "Guide to College English Teaching" lists cross-cultural education as an important part of college English courses. At the same time, ICAO's requirements for civil aviation pilots and controllers' cross-cultural abilities increase year by year, which raises new requirements for the cultivation of cultural abilities. This article explores this subject from two aspects of cross-cultural psychology and cross-cultural behavior, using SPSS22.0 data analysis method and Delphi method to establish an evaluation model, which includes four first-level indicators: attitude, awareness, knowledge and skill. Attitude and consciousness evaluate cross-cultural psychology, and knowledge and skills evaluate cross-cultural behavior. Under the 4 first-level indicators, there are 6 second-level indicators and 17 third-level indicators. This paper uses the accuracy and convenience of language operators in the process of information conversion to transform fuzzy subjective qualitative analysis into quantitative analysis, and proposes a set of evaluation methods for cross-cultural competence based on language operators. At the same time, an empirical study was conducted with C University as an example. The statistical results show that the method has good applicability and scientificity for the evaluation of the cross-cultural competence of civil aviation college students.

Keywords: cross-cultural, competence, cross-cultural psychology, civil aviation, language operator**AMS 2010 codes:** 90-08.[†] Email address: belle_wj@126.com[‡] Email address: liucmhuan_scu@163.com[§] Email address: zlzjdj@163.com[¶] Corresponding author. Email address: jinmaozhu@scu.edu.cn^{||} Email address: nympha.joseph@asu.edu.bh

1 Introduction

The cultural attributes of language determine that the college English curriculum should not only focus on instrumentality, but also on humanity. The newly-developed "Guide to College English Teaching" mentioned many times the cultivation of college students' cross-cultural abilities, which endowed the humanistic connotation of college English courses, and paid full attention to the cross-cultural communication courses. The "Guide" lists cross-cultural education as an important task of college English courses. It emphasizes that enhancing cross-cultural communication awareness and communicative competence is the teaching goal. At the same time, it also specifically explains the purpose, structure and content of the cross-cultural communication course. The "Guide" proposes that the purpose of offering cross-cultural communication courses in colleges and universities is to "provide cross-cultural education, help students understand the differences between different world views, values, and ways of thinking, at home and abroad, cultivate students' cross-cultural awareness, and improve students' social language skills And intercultural communication skills" [9]. The students of civil aviation schools shoulder the important task of the international development of our civil aviation industry, and they need to have a cross-cultural perspective and good cross-cultural communication skills. At the same time, airlines are constantly absorbing foreign pilots and foreign controllers. It is becoming more and more common for multinational pilots and controllers to work together. How to effectively communicate with them and ensure flight safety is particularly important. At present, there is little theoretical research on the cross-cultural competence of civil aviation college students, and empirical research is lacking. Therefore, it is of theoretical and practical significance to investigate and evaluate the status of intercultural competence of students in civil aviation universities.

Intercultural competence research has been rapidly developed in Europe and America since the 1960s and 1970s, and the concept of "intercultural competence" has been widely used. Byram divides cross-cultural competence into three aspects: attitude, knowledge, and skills [2]. Fantini pointed out that cross-cultural competence is a comprehensive ability to communicate properly and effectively with people from different cultures [4]. Dearsdorff believes that cross-cultural competence is the ability to communicate effectively and appropriately based on personal cross-cultural knowledge, skills, awareness and attitudes [3]. Spitzberg cited three main factors of intercultural competence: knowledge, motivation, and skill [7]. Although various scholars have different definitions and statements on cross-cultural competence, their connotations are basically the same. In the past two decades, China's cross-cultural competence evaluation research has also achieved many results. Zhang Hongling et al. Proposed a competition-based evaluation of cross-cultural competence. By constructing an evaluation index system for cross-cultural competence competition, a cross-cultural competence contest was designed, and then the content analysis method was used to statistically analyze the data of contestants to demonstrate the feasibility of the evaluation method. [13]. Wu Weiping and others conducted empirical research based on Byram's cross-cultural competence evaluation model theory, systematically and comprehensively analyzed the dimensions of consciousness, attitude, knowledge, and skills in the composition of college students' cross-cultural competence, and carried out. Exploratory and confirmatory factor analysis, constructed a good reliability and validity of Chinese college students cross-cultural ability evaluation scale [11]. Zhang Yong conducted a comprehensive analysis of empirical research on college students' cross-cultural competence from the perspective of foreign language teaching, and proposed future development directions for empirical research on cross-cultural communicative competence in foreign language education. How to do a good job in research design and determination of research methods will be developed in the future One of the key points [14].

Judging from the existing evaluation methods, there are more qualitative studies and less quantitative studies [15]. In particular, there are few studies on the evaluation of cross-cultural competence in the field of civil aviation, which is becoming more and more internationalized [16]. Therefore, this article combines the general trend of international development of civil aviation and the cross-cultural requirements for civil aviation practitioners, based on the existing literature, a set of evaluation models and systems for college students' cross-cultural abilities is established, and the characteristics of language operators. The evaluation method is proposed.

Finally, through case analysis, the practicality and scientificity of the method in evaluating cross-cultural competence are demonstrated.

1.1 Establish an indicator system

The evaluation of the cross-cultural competence of students in civil aviation institutions has a significant impact on the evaluation of cross-cultural communication and educational effects in civil aviation institutions and the external environmental management of civil aviation institutions. However, the existing research results do not have a reasonable and scientific theoretical system and evaluation system for judging the cross-cultural ability of civil aviation college students. In addition, there is no in-depth understanding of the importance of cross-cultural communication ability for students of civil aviation institutions and the necessity of evaluating the cross-cultural ability of students of civil aviation institutions for the training of students of civil aviation institutions. Therefore, this article uses the following methods to build an evaluation model.

According to the interpretation of cross-cultural competence by many scholars at home and abroad, based on Byram's cross-cultural competence (ICC) component model, the first-level indicators of cross-cultural competence evaluation are established from two aspects of cross-cultural psychology and cross-cultural behavior: attitude, awareness, knowledge And skills. At the same time, based on Byram's specific description of the above four dimensions, and referring to Fantini's cross-cultural ability evaluation scale and Wu Weiping's self-evaluation table of college students' cross-cultural knowledge, through consultation and investigation of experts and students, a four-by-one A preliminary index system consisting of first-level indicators, 8 second-level indicators and 20 third-level indicators. Based on the above evaluation indicators, this study set up a cross-cultural ability questionnaire. The questionnaire adopts a combination of closed and open forms. On the one hand, through the quantitative analysis of the closed questionnaire, the intercultural competence level of the research object is obtained. On the other hand, in combination with the in-depth investigation of the open questionnaire, a wider range of data is collected to qualitatively supplement and verify the results of the quantitative research.

In order to ensure the reliability and validity of the primary index, this study first conducted a pre-test to screen and adjust the primary index. The purpose was to test the rationality of the index system structure validity and the ownership of each index. For the sample of this pre-test, 364 questionnaires were collected from C University for SPSS data analysis through the distribution of online questionnaires. The overall Cronbach's Alpha value of the scale is $0.946 > 0.8$, indicating that the 20 questions in the questionnaire have good internal reliability. At the same time, the method of factor analysis is used for structural validity test. The data analysis results show that the KMO value of the scale is 0.933, indicating good validity. Bartlett's spherical test corresponds to a sig of 0.000, which means that the null hypothesis is rejected, indicating that the variables are not independent of each other, and are suitable for factor analysis. The results of factor analysis are shown in Table 1:

Table 1 is the factor load matrix obtained by SPSS22.0 software using principal component analysis and rotating the load matrix. The above table can clearly distinguish the four first-level indicators established previously. It can be seen from the above table that factor 1 corresponds to knowledge, factor 2 corresponds to attitude, factor 3 corresponds to skill, and factor 4 corresponds to awareness, and factor 2 is not divided into two principal components by the second-level indicators, and the third-level indicators of factor 3 are confusing. Part of the items occupy multiple principal components in the factor rotation load matrix, and there is a problem that the attribution between the two factors is unclear. The items need to be modified to adjust and delete the second-level indicators of the factors. As a result, U212 is willing to learn foreign languages and understand foreigners, U311 can use appropriate body language for cross-cultural communication, U411 can realize the cultural similarities and differences between foreigners when communicating with foreigners, and integrate U32 indicators into U31 Medium, integrate U42 indicator into U41. At the same time, this article uses Delphi method to establish further indicators and system. The Delphi method is a group decision-making method characterized by feedback, anonymity, and statistical estimation. It is particularly suitable for analyzing and predicting information that does not have a large amount of historical data and is easily affected by related factors. In this study,

Table 1 Rotate Matrix result 1.

	Element							
	1	2	3	4	5	6	7	8
U111	0.176	0.306	0.148	0.171	0.826	0.126	-0.04	0.015
U112	0.089	0.342	0.175	0.151	0.765	0.142	0.217	0.064
U121	0.055	0.814	0.122	0.104	0.34	0.113	-0.005	-0.089
U122	0.115	0.822	0.179	0.135	0.221	0.199	0.098	0.078
U123	0.087	0.829	0.127	0.264	0.104	0.058	0.15	0.116
U211	0.666	0.186	0.258	0.121	0.112	0.102	0.132	0.514
U212	0.769	0.061	0.076	0.153	0.073	0.056	0.13	0.486
U221	0.844	0.11	0.179	0.18	0.132	0.126	0.012	0.046
U222	0.863	0.069	0.164	0.19	0.075	0.085	0.067	-0.06
U223	0.804	0.035	0.154	0.087	0.054	0.213	0.261	-0.086
U311	0.279	0.182	0.261	0.309	0.076	0.124	0.756	0.106
U312	0.375	0.132	0.532	0.108	0.203	0.216	0.508	-0.028
U313	0.286	0.162	0.778	0.157	0.152	0.187	0.189	-0.047
U321	0.209	0.282	0.717	0.349	0.13	0.139	0.09	0.164
U322	0.17	0.129	0.605	0.408	0.176	0.385	0.137	0.16
U411	0.325	0.214	0.266	0.208	0.159	0.777	0.057	-0.053
U412	0.138	0.227	0.302	0.401	0.201	0.633	0.228	0.202
U421	0.246	0.311	0.248	0.666	0.046	0.286	0.164	-0.065
U422	0.244	0.251	0.279	0.619	0.189	0.409	0.214	0.046
U423	0.253	0.194	0.227	0.785	0.244	0.085	0.116	0.109

10 experts engaged in cross-cultural communication and education of civil aviation were invited to conduct various consultations and feedback, and 51 effective consultation information were collected. By screening and supplementing the initially proposed indicator system, the framework and specific indicators of the indicator system are finally determined. In addition, statistical analysis was carried out to check the collected data. After many rounds of consultation, feedback, modification and adjustment, this paper finally established a system of evaluation of cross-cultural communication ability of civil aviation college students with 4 first-level indicators, 6 second-level indicators and 17 third-level indicators, and continued to use SPSS22.0 uses principal component analysis to collect 327 questionnaires, rotate the load matrix and then obtain the factor load matrix for testing, as shown in Table 2:

The test of Table 2 shows that the analysis of the indicators and expected indicators is correct, and finally the system for evaluating the cross-cultural competence of civil aviation college students is produced, as shown in Table 3:

1.2 Index system description

The intercultural competence evaluation system of civil aviation colleges and universities evaluates students' intercultural communicative competence from two aspects of intercultural psychology and intercultural behavior, and is used to evaluate whether the students' intercultural competence can meet the needs of the international development of civil aviation. The system includes four evaluation dimensions, namely: knowledge, attitude, skills and awareness.

Knowledge dimension (Knowledge) includes the mastery of national cultural knowledge and cross-cultural knowledge. The cross-cultural knowledge reserve is the basis for cultivating and improving cross-cultural abilities. Understanding national knowledge includes having your own knowledge and insights into your country's

Table 2 Rotate element matrix.

	element					
	1	2	3	4	5	6
U111	.118	.206	.273	.112	.828	.057
U112	.247	.061	.231	.286	.765	.044
U121	.100	.117	.831	.046	.287	.071
U122	.110	.169	.875	.125	.188	.052
U123	.192	.207	.843	-.048	.055	.150
U211	.199	.125	.225	.241	.079	.903
U221	.157	.169	.012	.873	.138	.112
U222	.217	.241	.011	.816	.196	.139
U223	.331	.322	.122	.701	.104	.066
U311	.343	.668	.135	.346	.065	.094
U312	.319	.717	.108	.291	.163	.181
U313	.297	.764	.263	.140	.084	.003
U314	.326	.710	.199	.207	.137	.026
U411	.720	.283	.081	.344	.106	.137
U412	.805	.294	.142	.218	.126	.037
U413	.728	.374	.173	.134	.206	.109
U414	.672	.390	.213	.210	.150	.144

a. Extraction method: analysis of main components.

b. Rotation method: Kaiser normalized maximum mutation method.

c. Convergence cycle in 7 iterations.

culture, history, politics, geography, and economic development, as well as your own independent judgment on your country's lifestyle and values. Cross-cultural knowledge includes not only the understanding of foreign cultures, history, economy and values, but also the mastery of cross-cultural skills and strategies. Attitudes are the prerequisite for successful cross-cultural communication. The attitude dimension also includes attitudes towards both domestic and foreign cultures. For the national culture, we have to accept that it may be rejected and questioned in the foreign cultural values. At the same time, we also need to look at foreign cultures in a dialectical manner, not excluding or following blindly, seeking common ground while reserving differences. Skills are a powerful guarantee for cross-cultural communication. Participants in cross-cultural activities need to have the ability to interact with foreign cultures to promote the smooth progress of cross-cultural communication. Awareness is formed through the accumulation of cross-cultural theories and practices. Correct cross-cultural awareness is especially important for the cultivation and improvement of cross-cultural skills. It is also the foundation for building national cultural thinking and ensuring the smoothness of cross-cultural communication activities Carry out.

2 Evaluation of Intercultural Ability of Civil Aviation College Students Based on Language Operator

At present, in view of the characteristics of subjective information and indicators such as cross-cultural competence evaluation, the evaluation process mostly adopts qualitative analysis, and there are not many quantitative evaluations of cross-cultural competence. How to achieve quantitative conversion of subjective information is the key. The scientific nature and accuracy of language operators in information conversion make it possible to effectively deal with a series of fuzzy evaluation scenarios. Therefore, the language operator is suitable for the evaluation of cross-cultural ability of students in civil aviation institutions. This paper uses language operators

Table 3 Evaluation System of Intercultural Ability of Civil Aviation College Students.

first-level indicator	second-level indicator	third-level indicator
Knowledge	Knowledge of national knowledge	Understand China's history, geography, politics, and economic development and have its own knowledge and insights Understand the Chinese people's lifestyles and values, and have their own knowledge and insights on the roots of their lifestyles and values
	Understanding of cross-cultural knowledge	Understand foreign history, geography and socio-political knowledge Understand knowledge of foreign lifestyles and values Understand strategies and techniques for successful cross-cultural communication
Attitude	Attitude towards national culture	Ability to accept national cultural values may be questioned and denied in foreign cultures
	Attitude towards foreign culture	Willing to treat other countries' culture with an equal attitude, not excluding or obeying For all forms of communication, especially non-verbal communication, adopt a dialectical attitude, not blindly and reluctantly accept Able to accept the initial cultural conflict and willing to adapt and integrate into foreign culture through a period of running-in
Skills	Ability to interact with foreign cultures	Be able to correctly recognize misunderstandings and obstacles in cross-cultural communication Ability to seek common ground while reserving differences while interpreting different cultures Ability to learn about foreign culture through interviews with local people Ability to use relevant resources (books, newspapers, etc.) to understand the relationship between cultures of various countries
Awareness	Cross-cultural awareness	Be aware of the cultural similarities and differences that exist when communicating with foreigners Be aware of foreigners' views on themselves and the reasons for their prejudice Be aware of the need to adjust communication strategies based on specific scenarios of different cultures Be aware of the cultural values that foreigners need to understand from their feedback

as the basic method of empirical research, converts language information into language information matrix, and calculates the scores of various indicators to analyze the compliance status, and obtains the relevant ability level.

2.1 Language Operator Theory

In daily life, people use natural language when exchanging information, and the semantics of natural language is full of unquantifiable nature. In order to clarify and quantify natural language to further distinguish and characterize the degree of natural language variables [8], people usually use modifiers in natural language, such as "more", "slightly", "a little", "Very" and so on. Thus, the concept of linguistic variables was introduced. We can define modifiers such as "more", "slightly", "a little bit", and "very" according to the degree of size as a number allocated according to size, used to evaluate the quality of the project, and finally determined according to the algorithm of language variables Evaluation value to define the evaluation object.

Definition 1. [1,12] is set as a finite discrete set, satisfying:

$$S = \{s_j | \emptyset = -t, -(t-1), \dots, 0, \dots, t-1, t\} (t \in Z^* \text{ and } t \geq 1)$$

s_j is a linguistic variable. $-t$ and t represent the lower and upper limits of these language variables, respectively. Therefore, the quality evaluation set above can be expressed as $S = s-3, s-2, s-1, 0, s+1, s+2, s+3$.

S is discrete. Therefore, some language information may be lost in the aggregation. To avoid this, S can be extended to a continuous set.

$$\bar{S} = \{\bar{s}_j = -(t+1) < a < t+1, a \in R\} (t \in Z^* \text{ and } t \geq 1), S \subset \bar{S}$$

Definition 2. [10] operation of language variables:

$$f(x) = \tan \frac{\pi x}{2t+2}, x \in (-t-1, t+1). \text{ If } \forall \bar{s}_a, \bar{s}_\beta \in \bar{S}, \lambda \in R$$

Then:

$$(1) \bar{s}_a \oplus \bar{s}_\beta = \bar{s}_{f^{-1}(f(a)+f(\beta))}$$

$$(2) \bar{s}_a \otimes \bar{s}_\beta = \bar{s}_{f^{-1}(f(a)*f(\beta))}$$

$$(3) \lambda \bar{s}_a = \bar{s}_{f^{-1}(\lambda f(a))}$$

Where $f^{-1}(x) = \frac{(2t+2)\arctan(x)}{\pi}$ is a monotone continuous function, satisfying.

$$(1) \lim_{x \rightarrow -\infty} f^{-1}(x) = -t-1$$

$$(2) \lim_{x \rightarrow +\infty} f^{-1}(x) = t+1$$

$$(3) f^{-1}(0) = 0$$

Then, the mean and variance of the language vector composed of language variables are as follows:

Definition 3. [5] let language carrier

$$(1) E(\bar{s}_a) = \bar{s}_a = \bar{s}_{f^{-1}(\frac{1}{n} \sum_{i=1}^n f(a_i))}$$

$$(2) D(\bar{s}_a) = \frac{1}{n} \sum_{i=1}^n (f(a_i) - \frac{1}{n} \sum_{i=1}^n f(a_i))^2$$

Use language weighted arithmetic average (LWAA) operator. In language information aggregation, the weighted average method is usually used. According to the relevant concepts and calculations of language operators and weighted average operators, language weighted arithmetic average operators are defined:

Definition 4. [6] let $\{\bar{s}_{\beta_1}, \bar{s}_{\beta_2}, \dots, \bar{s}_{\beta_n}\}$ be the set of language variables to be aggregated.

As for the definition $LWAA: \bar{S}^n \rightarrow \bar{S}$, if:

$$\begin{aligned} & LWAA(\bar{s}_{\beta_1}, \bar{s}_{\beta_2}, \dots, \bar{s}_{\beta_n}) \\ &= \omega_1 \bar{s}_{\beta_1} \oplus \omega_2 \bar{s}_{\beta_2} \oplus \dots \oplus \omega_n \bar{s}_{\beta_n} \\ &= \bar{s}_{f^{-1}(\omega_1 f(\beta_1) + \omega_2 f(\beta_2) + \dots + \omega_n f(\beta_n))} \\ &= \bar{s}_{f^{-1}[\sum_{j=1}^n \omega_j f(\beta_j)]} \end{aligned}$$

where is the corresponding weight vector $W = (\omega_1, \omega_2, \dots, \omega_n)^T$ that satisfies $\omega_j \geq 0 (j = 1, 2, \dots, n)$ $\sum_{j=1}^n \omega_j = 1$. Therefore, LWAA represents the language-weighted arithmetic average operator.

If all linguistic variables in the collection have the same weight, then:

$$\begin{aligned} \text{LAA}(\bar{s}_{\beta_1}, \bar{s}_{\beta_2}, \dots, \bar{s}_{\beta_n}) \\ &= \frac{1}{n} \bar{s}_{\beta_1} \oplus \frac{1}{n} \bar{s}_{\beta_2} \oplus \dots \oplus \frac{1}{n} \bar{s}_{\beta_n} \\ &= \frac{1}{n} (\bar{s}_{\beta_1} \oplus \bar{s}_{\beta_2} \oplus \dots \oplus \bar{s}_{\beta_n}) \\ &= \frac{1}{n} \bar{s}_{f^{-1}[\sum_{j=1}^n f(\beta_j)]} \end{aligned}$$

2.2 Evaluation Model of Intercultural Ability of Civil Aviation College Students Based on Language Operator

This article selects N number of evaluators to evaluate M number of indicators to obtain language information and corresponding matrix;

(1) Determine the score of each indicator

According to definition 3, the indicator score Sth is:

Expression1

$$E(\bar{s}_{a_j}) = \bar{s}_{\bar{a}_j} = \bar{s}_{f^{-1}(\frac{1}{n} \sum_{i=1}^n f(a_{ij}))}, j=1, 2, \dots, m. \quad (1)$$

(2) Determine the weight of each indicator

To a certain extent, the degree of change of the indicator can reflect its importance. In other words, the greater the degree of change in the indicator, the greater the amount of information provided, and the greater its weight. Therefore, this paper uses the standard deviation to determine the weight of each indicator.

(1) According to Definition 3, the standard deviation of the indicator Sth is

Expression2

$$\sigma(\bar{s}_{a_j}) = \sqrt{D(\bar{s}_{a_j})} = \sqrt{\frac{1}{n} \sum_{i=1}^n (f(a_{ij}) - f(\bar{a}_j))^2}, j = 1, 2, \dots, m \quad (2)$$

(2)The weight of the indicator Sth is expressed as:

Expression3

$$\omega_j = \frac{\sigma(\bar{s}_{a_j})}{\sum_{j=1}^n \sigma(\bar{s}_{a_j})}, j = 1, 2, \dots, m \quad (3)$$

(3)Determine the comprehensive evaluation score

According to definition 4, the comprehensive evaluation score is calculated as follows:

Expression4

$$\bar{S}_\beta = \omega_1 \bar{s}_{\bar{a}_1} \oplus \omega_2 \bar{s}_{\bar{a}_2} \oplus \dots \oplus \omega_n \bar{s}_{\bar{a}_n} = \bar{s}_{f^{-1}[\sum_{j=1}^n \omega_j f(\bar{a}_j)]} \quad (4)$$

(3) Based on the language operator, the steps to evaluate the cross-cultural competence of civil aviation college students:

Step 1: Each evaluator scores the indicator to obtain the language information matrix

$$\bar{S} = (\bar{s}_{a_{ij}})_{n \times m}$$

Step 2: Use equation (1) to get the score of each indicator.

Step 3: Find the weight of each indicator through equations (2) and (3),

Step 4: Obtain the overall evaluation score through equation (4).

3 Empirical Research

C University is a college directly under the Civil Aviation Administration of China. It is known as the cradle of Chinese civil aviation pilots and has trained most of our pilots and controllers. The core of building a strong civil aviation country is the international competitiveness of the civil aviation industry. The enhancement of international competitiveness requires strong support from international talents. Under the general trend of international development of civil aviation, the school's requirements for students' cross-cultural ability are also increasing year by year. At present, the school has not only carried out relevant cross-cultural courses to broaden students' cross-cultural horizons, but also actively provides students with cross-cultural practical activities through various international cooperation projects. In order to further explore the cultivation of intercultural abilities of students in civil aviation universities, this paper evaluates the cross-cultural abilities of students in civil aviation universities and randomly selects 297 students in the school for online questionnaire survey. The questionnaire survey is divided into objective and subjective parts. The objective data is selected by the students for five options for each topic, and the scoring adopts a five-point system. The subjective part is used as a qualitative analysis material to verify and supplement objective data. Through empirical calculations, the scores of each indicator and the weight of each indicator are obtained, as shown in Table 4 and Table 5 below:

Table 4 Scores of indicators in the cross-cultural competence evaluation model.

The Score of 17 Indicators					
$E(\bar{S}_{a1})$	$E(\bar{S}_{a2})$	$E(\bar{S}_{a3})$	$E(\bar{S}_{a4})$	$E(\bar{S}_{a5})$	$E(\bar{S}_{a6})$
0.649454	0.781222	0.092743	0.051964	-0.19608	0.54871
$E(\bar{S}_{a7})$	$E(\bar{S}_{a8})$	$E(\bar{S}_{a9})$	$E(\bar{S}_{a10})$	$E(\bar{S}_{a11})$	$E(\bar{S}_{a12})$
1.362052	1.262259	1.00556	1.013864	1.0111	0.863969
$E(\bar{S}_{a13})$	$E(\bar{S}_{a14})$	$E(\bar{S}_{a15})$	$E(\bar{S}_{a16})$	$E(\bar{S}_{a17})$	
0.863969	1.016623	0.821474	0.752916	0.854938	

Table 5 Weights of indicators in the cross-cultural competence evaluation model

The weight of 17 Indicators					
$E(\bar{S}_{a1})$	$E(\bar{S}_{a2})$	$E(\bar{S}_{a3})$	$E(\bar{S}_{a4})$	$E(\bar{S}_{a5})$	$E(\bar{S}_{a6})$
0.054356	0.0536	0.051627	0.050227	0.05928	0.069699
$E(\bar{S}_{a7})$	$E(\bar{S}_{a8})$	$E(\bar{S}_{a9})$	$E(\bar{S}_{a10})$	$E(\bar{S}_{a11})$	$E(\bar{S}_{a12})$
0.065779	0.06373	0.057431	0.057823	0.058534	0.060506
$E(\bar{S}_{a13})$	$E(\bar{S}_{a14})$	$E(\bar{S}_{a15})$	$E(\bar{S}_{a16})$	$E(\bar{S}_{a17})$	
0.059897	0.061282	0.058575	0.058835	0.058818	

According to the SPSS evaluation results, the total score of the cross-cultural competence of the civil aviation colleges and universities is 0.797, indicating that contemporary students have good cross-cultural communication skills. At the same time, through the analysis of the indicators at the three levels, we can also see that there is still a lot of room for improvement in the cross-cultural ability of students in civil aviation institutions, which requires the joint efforts of schools, teachers and students. Looking at the scores of the 17 indicators, 6 of them scored more than 1. The second-level indicator "Attitude to Foreign Culture" scored the highest overall. The three third-level indicators under this indicator scored 1.362, 1.262 and 1.006, indicating that students of

contemporary civil aviation institutions are tolerant and open in their attitudes towards foreign cultures. Such an equal and objective attitude also helps civil aviation practitioners to smoothly carry out international exchanges and cooperation in their daily work. The indicator of the second highest score is "the ability to interact with foreign cultures." With the increase of cross-cultural practice activities of contemporary college students, whether it is an international cooperation project, an international summer camp or a trip abroad, students are given more experience of cross-cultural exchanges, which also forms a set of their own communication methods. In the interaction between the two cultures, learn to seek common ground while reserving differences, the score is 1.011. Based on an objective and open attitude to foreign culture and rich cross-cultural practical experience, another indicator with a score of more than 1 is "aware of the cultural similarities and differences that exist when communicating with foreigners". The score is 1.017, indicating that the school the cross-cultural curriculum has played a positive and positive role in the formation of students' cross-cultural awareness.

Among the 17 specific indicators, 8 of them have scores between 0.5 and 1, indicating that at present, these aspects are okay, but there is still a lot of room for improvement. For example, the national knowledge and Understanding and in-depth study of culture, because the country's cultural knowledge is the basis of intercultural communication, which helps to promote the in-depth development of intercultural communication. Secondly, in terms of improving cross-cultural skills, we should further expand the methods and means of cross-cultural communication, understand foreign cultures through conversations with locals, books, magazines, multimedia, etc., and dialectically view the similarities and differences between the two cultures. At the same time, the scores of the remaining three third-level indicators of cross-cultural awareness are 0.821, 0.753, and 0.855, respectively, indicating that the students of civil aviation colleges have certain cross-cultural awareness, but they also need to continue to accumulate their own through continuous accumulation of cross-cultural theory and practice humanities, cultivate international thinking.

The three indicators with lower scores belong to the category of "knowledge of cross-cultural knowledge". Among them, the two scores of "knowledge of foreign countries' history, geography, and socio-political knowledge" and "knowledge of foreign country's lifestyle and values" are both less than 0.1, indicating that everyone's understanding of foreign cultures needs to be strengthened. On the one hand, schools need to take courses Starting from the aspect of setting up, setting up related compulsory and elective courses to increase students' background knowledge, on the other hand, it also requires teachers to add a cultural section in the language classroom. After all, culture is part of the language, there is no corresponding cultural background to support, language learning The effect will be greatly reduced. The score of "Understanding strategies and techniques for successful cross-cultural communication" is negative, indicating that the relevant strategies and techniques have not been well mastered by everyone. Good strategies and skills can be continuously acquired in daily experience, and at the same time, the concept of a scientific system needs to be formed through relevant theoretical learning. Strategies and techniques cannot be mastered in a day or two, and need to be repeatedly tested by theory and time to form a set of cross-cultural communication systems suitable for you. Schools should also instill relevant strategies and skills for students through cross-cultural courses and cross-cultural practical activities. For civil aviation practitioners, how to better use cross-cultural strategies and techniques is very important for the daily operation of civil aviation transportation, especially the operation of international routes and flights.

On the other hand, by categorizing and analyzing the results of the open questionnaire, it can be seen that the main difficulties faced by the students of civil aviation institutions in conducting cross-cultural communication also come from the language itself, including Unsuitable, etc., this puts forward new requirements for basic English courses in civil aviation institutions. In the future teaching, as many diversified teaching methods as possible, with the help of modern teaching tools and equipment, strive to improve students' English expression level. Although intercultural communication will be restricted due to language, culture and other factors, most students can solve these difficulties through body language and multi-channel interpretation to achieve the purpose of communication.

4 Conclusion

This paper investigates the current situation of intercultural competence of civil aviation college students, and evaluates the comprehensive intercultural competence from both qualitative and quantitative aspects. There are deficiencies and areas for improvement. The evaluation results provide a theoretical reference for the establishment of cross-cultural courses and English courses in civil aviation institutions. The innovation of this article lies in the introduction of the basic theory of language operators, the establishment of a cross-cultural competence evaluation model system, the weighting of each level of the system and the final evaluation value. Through the reliability and validity analysis of the questionnaire with the help of SPSS statistical software, the evaluation process combining quantitative data and qualitative analysis ensures the scientificity and objectivity of the evaluation results. The evaluation method and evaluation model of cross-cultural competence proposed in this paper provide the theoretical and practical basis for similar research in the future, and are of reference significance for the evaluation of other major students in other universities.

Acknowledgments

This work is supported by Innovative Spark Project of Sichuan University (No. 2019hhs-15) and Science and technology project of Sichuan Tobacco Corporation (No.SCYC202015).

References

- [1] Aggarwal, M. Adaptive linguistic weighted aggregation operators for multi-criteria decision making. *Applied Soft Computing*, 58(2017),690-699.
- [2] Byram, M. *Teaching and Assessing Inter cultural Communicative Competence* [M]. Clevedon: Multilingual Matters,1997.
- [3] Deardorff, D.K. Identification and assessment of intercultural competence as a student outcome of internationalization. *Journal of Studies in Intercultural Education*, 10(3) 2006, 241-266.
- [4] Qishou Ke, Shaofei Wu, Mingqing Wang, Yuntao Zou. Evaluation of Developer Efficiency Based on Improved DEA Model, *Wireless Personal Communications*, 102(4)(2018), 3843-3849.
- [5] He, Y., Guo, H., Jin, M.,& Ren, P. A linguistic entropy weight method and its application in linguistic multi-attribute group decision making. *Nonlinear Dynamics*, 84(1) (2016), 399-404.
- [6] Hu, M., Ren, P., Jin, M., Lan, J.,& Luo, Y. A satisfaction evaluation method for scenic spot based on linguistic weighted arithmetic average operator. *Applied Mathematics & Information Sciences*, 7(6) (2013), 2259-2270.
- [7] Shaofei Wu, Jun Liu, Lizhi Liu. Modeling method of internet public information data mining based on probabilistic topic model, *The Journal of Supercomputing*, 75(2019), 5882-5897.
- [8] Wang, Q., Wu, C., & Sun, Y. Evaluating Corporate Social Responsibility of Airlines Using Entropy Weight and Grey Relation Analysis. *Journal of Air Transport Management*, 42 (2015), 55-62.
- [9] Wang, S.R. An interpretation of the Guidelines on College English Teaching. *Foreign Language World*, 174(03) (2016), 2-10.
- [10] Wu, Z., Chen, Y. The maximizing deviation method of group multiple attribute decision making under linguistic environment. *Fuzzy Sets and Systems*, 158(14) (2007), 1608-1617.
- [11] Wu, W.P., Fan, W.W., & Peng, R.Z. An analysis of the assessment tools for Chinese college students intercultural communicative competence. *Foreign Language Teaching and Research(bimonthly)*, 45(4) (2013), 581-592.
- [12] Xu, Y., Merigo, J.M., & Wang, H. Linguistic power aggregation operators and their application to multiple attribute group decision making. *Applied Mathematical Modelling*, 36(11) (2012),5427-5444.
- [13] Zhang, H.L., Yu, Y.D., & Shen, X.T. Contests as an intercultural competence assessment method: A case study of the SFLEP Shanghai Intercultural Competence Contest. *Foreign Language World*, 184(01) (2018),52-61.
- [14] Zhang, Y. A Review of Empirical Studies on Intercultural Communicative Competence of College Students in China. *Foreign Language research in Northeast Asia*, 14(3) (2016), 24-28.
- [15] JP Ruiz-Fernández, Benlloch J , MA López, et al. Influence of seasonal factors in the earned value of construction[J]. *Applied Mathematics and Nonlinear Sciences*, 4(1)(2019),21-34.
- [16] Acar E, Zgi A, Serenbay S K. Note On Jakimovski-Leviatan Operators Preserving $e-x$ [J]. *Applied Mathematics and Nonlinear Sciences*, 4(2) (2019), 543-550.

This page is intentionally left blank