

Research on the Evaluation of Online Teaching Quality for International Students from Universities in China Under the Epidemic

Zhang Diping, zhangdiping163@163.com, Zhejiang University of Science and Technology, <https://orcid.org/0000-0003-2525-9599>

Ao Shuang, 2232845060@qq.com, Zhejiang University of Science and Technology, <https://orcid.org/0000-0003-2556-2301>

Gu Jian Ya, gujianya126@126.com, Zhejiang University of Science and Technology, <https://orcid.org/0000-0003-4924-7904>

SUMMARY

The teaching of foreign students in China has become an important part of online teaching and one of the implementation problems during the epidemic. In order to better understand the online teaching situation and quality of foreign students in China, and to better carry out the online teaching of foreign students in China, this article firstly constructs the online teaching quality evaluation index system based on the investigation and analysis of the current situation of online teaching for foreign students in China. Secondly, further uses the analytic hierarchy process to determine the weight of each index, and finally uses the fuzzy comprehensive evaluation method to comprehensively evaluate the online teaching quality of foreign students in China. The research results show that the quality of online teaching for foreign students from Zhejiang Province is good. This research provides a model that can be used for reference for the follow-up online teaching of international students in China.

Keywords: online teaching quality, evaluation index system, analytic hierarchy process, fuzzy comprehensive evaluation method

INTRODUCTION

At the beginning of 2020, a sudden epidemic broke the peaceful atmosphere of the New Year, and even disrupted the normal teaching order of universities, middle schools and primary schools in the spring. In response to the impact of the coronavirus epidemic on the normal opening of colleges and universities and classroom teaching, the Ministry of education issued the "Guiding opinions on doing a good job in the organization and management of online teaching in general colleges and universities during the period of epidemic prevention and control", requiring the universities and the society participation realizes "stopping classes without stopping teaching, and closing classes without stopping school."

In order to implement the spirit of the relevant documents of the Ministry of education, most colleges and universities in Zhejiang province officially opened a new semester online teaching model around the end of February. With the continuous deepening of the international school-running model, the number of foreign students in Zhejiang Province is increasing. During the epidemic, online teaching for international students in China has become an important part of teaching and one of the implementation problems. So far, there is no suitable online teaching quality evaluation index system. On the other hand, the quality of online teaching directly affects the follow-up course learning of foreign students in China. This article aims to explore the current status of online teaching for foreign students in China and the evaluation of online teaching quality.

The outbreak of the epidemic has had a huge impact on the normal teaching of students all over the country. Especially at present, the epidemic situation in foreign countries is becoming increasingly serious, and the normal teaching of foreign students in China needs to be solved urgently. Based on the domestic and foreign research literature, it is found that there are few literatures on the teaching quality and teaching situation of Chinese overseas students, and the relevant research has not had a set of objective, reasonable and operability evaluation standards, and there is no evaluation index system for foreign students teaching in China, especially the lack of reasonable weight assignment of each index in the evaluation system. Therefore, this study takes Zhejiang University of Science and Technology as an example to explore and analyze the online teaching quality of overseas students in this school.

LITERATURE

The Establishment of Online Teaching Quality Evaluation Index System

Foreign online course evaluation research started relatively early, especially in Western developed countries such as the United States and the United Kingdom, which have accumulated a wealth of research results and a series of representative online course evaluation index systems have emerged (Zhou & Zhao, 2020). The North American

Online Teaching Council (NACOL), a non-profit international organization, has established an online course evaluation standard system—the online course evaluation standard. This standard is widely used in many states and is the most authoritative online course evaluation standard in the southern region of the United States. In 2014, the Quality Matters project released the fifth edition of the Higher Education Edition Online Course Evaluation Index System—"Standards from the QM Higher Education Rubric", the evaluation index system contains 8 first-level indicators, which are course browsing and introduction, learning objectives (or target skills), evaluation and assessment, teaching materials, course activities and learner interaction, curriculum technology, learner support, accessibility and ease of use, each of the first-level indicators has a total of 43 evaluation criteria. This evaluation index can reflect the status quo of foreign online course construction, and then provide a reference for guiding the construction and development of domestic online courses (Quality Matters, 2014).

The Ministry of Education of my country issued the "Online Course Evaluation Specification" for higher education and other fields. The specification mainly evaluates the quality characteristics of online courses from the four dimensions of course content, instructional design, interface design and technology, and puts forward the generality of online course evaluation and specifications. Some researchers proposed that the evaluation of online courses should be carried out from the three dimensions of teaching organization and management, teaching methods, and teaching curriculum design, and refined them to obtain 4 secondary indicators and 30 tertiary indicators (Lei, 2021). There are also study established an evaluation index system from online teaching, student self-management, and online teaching platform based on the results of the questionnaire, and used the Probit model for evaluation and analysis (Wang et al., 2021). And some studies selected 12 indicators such as feedback management, course quality, performance expectations, cognitive load, and ease-of-use expectations to construct a network teaching effect evaluation system, and evaluate the effect of network teaching based on the analytic hierarchy process (Sun et al., 2017). In addition, some studies have also established a "four-in-one" online teaching evaluation model that integrates college leaders, teachers, students, and teaching supervision (Zhang et al., 2020).

Online teaching quality evaluation

Comprehensive research literature found that some scholars used online assessment methods to evaluate the teaching quality of colleges and universities during the epidemic (Yu, 2020), and believed that this method overcomes the limitations of traditional assessment methods. Some scholars also use anonymous questionnaires to obtain data, and use descriptive statistics to evaluate online courses (Yang, 2021). In addition, mathematical models such as correlation analysis, multiple regression analysis, and Probit model have been used to evaluate the quality of online teaching (Lei, 2021; Wang, 2021).

METHOD

Participants

The International student center of school conducted interviews and questionnaire surveys with teachers and international students to grasp the current status of online teaching for international students. Participants in the study included 1,270 college students and 35 foreign teachers studying online at Zhejiang University of Science and Technology. Stratified sampling is used in this study to better understand the evaluation of online teaching quality at all levels. The details of participants students are shown in the Table 1.

Table 1. Basic information about students participants

Participants		f	%
Gender	Male	830	65.4
	Female	440	34.6
Grade	1	355	27.95
	2	332	26.14
	3	317	24.96
	4	266	20.94
Degree	undergraduates	1066	83.94
	master's degree	204	16.06

Data Collection Tools

Semi-structured interviews and online questionnaires were used as data collection tools in this study. The semi-structured interviews were mainly conducted with teachers from Zhejiang University of Science and Technology, using uniform questionnaires and forms to conduct the survey, including 15 single choice questions, 5 multiple choice questions and 2 open-ended questions. The object of the questionnaire are mainly international students of the university, mainly with single choice and multiple choice. Questionnaire survey refers to the method of collecting data by asking respondents to answer detailed and thorough questionnaires. Before the questionnaire and interview, the participants were informed that the answers were used as the target study.

Data Analysis

First of all, some teachers have resistance and fluke psychology. One is due to unfamiliarity with electronic

products. There is a feeling of fear and trouble. Some teachers suddenly changed their minds the day before the start of the class. They proposed various reasons and withdrew the original online teaching arrangement. The second is to believe that the epidemic will be fully controlled soon, and online teaching is not required, and offline supplementary lessons have been proposed. Secondly, some teachers lack experience in the selection of online teaching platforms and methods, and some are arbitrary or perfunctory. During this period, most teachers began to adjust the teaching platform or method after debugging or trial broadcasting, but some teachers did not adjust it before class, which affected the effect of formal class. Some teachers use WeChat groups to attend classes, but they do not implement live teaching, the effect is not satisfactory. In addition, teachers lack experience and adequate preparation for online classroom management, and complain about the difficulty of grasping the attendance rate and classroom interaction of foreign students. A few foreign students entered the course group and refused to change the group nickname, which increased the difficulty of classroom management for the teacher. There are also individual international students who have been quarantined in their own countries due to the need for epidemic control.

Most of our international students come from Africa, and a few come from Europe and Asia. Some overseas students have returned to their own country, and there are problems with jet lag, especially in the early morning hours of the first or two classes in the morning. The questionnaire on the online teaching quality of overseas students involves five aspects, including the choice of teaching platform, learning equipment, teaching form, online interaction between teachers and students, the amount of homework, etc. The above data are sorted out in Table 2. Table 2. Analysis of online teaching questionnaire survey

Questionnaire analysis		%
Teaching platform	Ding Talk groups	63
	Others	36
Learning equipment	mobile phones	48
	computers	20
	both	32
Preferred teaching format	Provide learning materials for self-study	28.7
	Live broadcast & online interaction	30.9
	Recording & online interaction	23.4
	No interactive live lectures	9.6
Frequency of online class interaction	Teaching platform & online discussion	7.4
	Actively	47.9
	Sometimes	38.3
	Occasionally	11.7
Amount of online homework	No interaction	2.2
	Reasonable	62.8
	Too much	30.9
Teachers' online answers	Too little	6.3
	Good	55.3
	General	37.2
	Bad	7.5

In summary, most international students are satisfied with the online teaching situation, but there is still room for improvement: For the online interaction situation, teachers should design more interactive links to activate the classroom atmosphere, stimulate students' interest in learning, and make student actively communicates with teachers and participates in classroom discussions. Regarding the question-answering situation, teachers should answer students' learning puzzles in a timely manner, rationally use a variety of teaching methods, and inspire students to think seriously.

RESULTS

Establish An Evaluation Index System

The process of teaching quality evaluation is a complex system engineering involving many influencing factors and objective conditions. [Chen et al. \(2020\)](#) observed and collected a large number of online teaching cases during the epidemic, analyzed the characteristics and implementation effect of various tools and platforms used in online teaching, and provided a greater reference value for carrying out online teaching activities. Combining the research results of the aforementioned scholars and the establishment of an evaluation index system must follow the principles of feasibility, systematization, comparability, and practicality, and fully consider the current status and status of online teaching for foreign students in China in terms of teaching content, teaching methods, and teaching

effects. Characteristics, this article constructs the following evaluation index system for the teaching quality of foreign students in China.

Table 1. Evaluation index system of online teaching quality for international students in China

First grade indexes	Second index
Teaching preparation	Teachers can use the teaching platform proficiently
	Students can master the basic requirements of online learning The teacher prepares enough lessons and has a practical teaching plan.
Teaching content	The teacher is proficient in the content of the lecture The amount of teaching knowledge is moderate and the content is substantial Highlight the key points and difficulties, and let students master the key and difficult points.
	Teachers and students use English to communicate, and the expression is clear. The language is vivid, concise, and clear
Teaching method	Reasonable use of teaching methods, good at inspiring and guiding thinking Appropriate use of various modern teaching aids and multimedia technology
	Teachers can answer students' learning puzzles in a timely manner Able to handle domestic and foreign networks and jet lag issues during teaching Able to do online time management according to requirements, reasonable time allocation for each link Teachers and students use a variety of network tools to interact, and the classroom atmosphere is active

Fuzzy Comprehensive Evaluation

The fuzzy comprehensive evaluation method is based on fuzzy mathematics and applies the principle of fuzzy relation synthesis to quantify some factors with unclear boundary and difficult to quantify. It is a comprehensive evaluation method for the membership grade of evaluated objects from multiple factors. It is a good method to judge multi-factor and multi-level complex problems. It is difficult to replace other mathematical branches and models. (Du&Pang, 2005). Therefore, this article uses this method to comprehensively evaluate and analyze the online teaching quality of foreign students in China. First define the comment set $V = \{\text{Excellent, Good, Pass, Fail}\}$, and assign the values as 95, 80, 60, and 50 in turn. The comment sets of the second-level indicators corresponding to other first-level indicators are also processed in the same way.

According to the previous article, the evaluation index set of online teaching for international students in China is $U = \{\text{Teaching preparation, Teaching content, Teaching method, Teaching implementation, Teaching effect}\}$. On this basis, the rationality of these types of indicators needs to be tested to ensure that the indicators can correctly reflect the effects of English teaching. This article uses experts with extensive experience in online teaching of international students to conduct surveys and evaluations of the five major indicators to ensure that they have a good understanding of the online teaching of international students, and then use the analytic hierarchy process to determine the weight of each indicator. The evaluation results of these experts on the relative importance of the above five indicators are shown in Table 2.

Table 2. Evaluation results of relative importance of first-level indicators

	Teaching preparation	Teaching content	Teaching method	Teaching implementation	Teaching effect
Teaching preparation	1	1/3	1/3	1	1/5
Teaching content	3	1	1	3	1
Teaching method	3	1	1	3	1/4
Teaching implementation	1	1/3	1/3	1	1/3
Teaching effect	5	1	4	3	1

Therefore, the first-level judgment matrix is

$$A = \begin{pmatrix} 1 & 1/3 & 1/3 & 1 & 1/5 \\ 3 & 1 & 1 & 3 & 1 \\ 3 & 1 & 1 & 3 & 1/4 \\ 1 & 1/3 & 1/3 & 1 & 1/3 \\ 5 & 1 & 4 & 3 & 1 \end{pmatrix}$$

Using Stata software to calculate the maximum eigenvalue of A $\lambda_{\max}=5.2151$, The corresponding feature vector is:

$$X_0=[0.1427 \ 0.4863 \ 0.3773 \ 0.1621 \ 0.7580],$$

The weights of the first-level indicators can be obtained by normalization:

$$Z=[0.0742 \ 0.4863 \ 0.3773 \ 0.1621 \ 0.7580]$$

Consistency indicator CI and consistency ratio CR are as follows:

$$CI = \frac{\lambda_{\max} - n}{n - 1} = 0.054, CR = \frac{CI}{RI} = 0.048$$

The average random consistency is defined by the value of RI in Table 3 (Hu & Yi, 2019):

Table 3. The value of the average random consistency index RI

Dimension	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.52	0.89	1.12	1.26	1.36	1.41	1.46	1.49

The smaller the consistency ratio CR, the better the consistency of the judgment matrix. When CR is equal to 0, the judgment matrix is completely consistent; when CR is less than 0.1, the consistency of the judgment matrix can be considered to be better and the test passes. It can be seen that the consistency ratio of the judgment matrix A is less than 0.1, so the judgment matrix passes the test and is reasonable and reliable.

Secondary index weight determination is similar to the above method, the index weight is shown in table 4.

Table 4. The weight of each indicator

First grade indexes	Weights	Second index	Weights
Teaching preparation	0.0742	Teachers can use the teaching platform proficiently	0.1571
		Students can master the basic requirements of online learning	0.2493
		The teacher prepares enough lessons and has a practical teaching plan.	0.5936
Teaching content	0.2528	The teacher is proficient in the content of the lecture	0.3469
		The amount of teaching knowledge is moderate and the content is substantial	0.1985
		Highlight the key points and difficulties, and let students master the key and difficult points.	0.4546
Teaching method	0.1961	Teachers and students use English to communicate, and the expression is clear.	0.1689
		The language is vivid, concise, and clear	0.2609
		Reasonable use of teaching methods, good at inspiring and guiding thinking	0.4512
		Appropriate use of various modern teaching aids and multimedia technology	0.1190
Teaching implementation	0.0843	Teachers can answer students' learning puzzles in a timely manner	0.3835
		Able to handle domestic and foreign networks and jet lag issues during teaching	0.2947
		Able to do online time management according to requirements, reasonable time allocation for each link	0.1119
		Teachers and students use a variety of network tools to interact, and the classroom atmosphere is active	0.2100
Teaching effect	0.3940	The mastery of basic knowledge, theories and skills of students	0.5500
		Classroom discipline and attendance rate	0.2098
		Students have a strong interest in learning, take the initiative to communicate with teachers, and actively participate in discussions	0.2402

According to the above level of indicators for a single index fuzzy evaluation. The fuzzy evaluation matrix of the

fuzzy relationship between the sub-factor u_1 and the evaluation set V is obtained by statistics of each secondary indicator as follows:

$$R_1 = \begin{pmatrix} 0.813 & 0.112 & 0.075 & 0 \\ 0.782 & 0.136 & 0.082 & 0 \\ 0.893 & 0.104 & 0.003 & 0 \end{pmatrix}$$

According to the above fuzzy evaluation matrix R_1 and the weight of secondary indicators of teaching preparation, the evaluation vector of single factor of secondary indicators can be obtained. The specific calculation process is as follows:

$$\begin{aligned} B_1 = A_1 \times R_1 &= (0.1571 \quad 0.2493 \quad 0.5963) \begin{pmatrix} 0.813 & 0.112 & 0.075 & 0 \\ 0.782 & 0.136 & 0.082 & 0 \\ 0.893 & 0.104 & 0.003 & 0 \end{pmatrix} \\ &= (0.852 \quad 0.114 \quad 0.034 \quad 0) \end{aligned}$$

The determination of the evaluation vector of a single factor of other secondary indicators is similar to the above method.

$$\text{Evaluation result of teaching content: } B_2 = A_2 \times R_2 = (0.828 \quad 0.121 \quad 0.051 \quad 0)$$

$$\text{Evaluation result of teaching method: } B_3 = A_3 \times R_3 = (0.795 \quad 0.111 \quad 0.094 \quad 0)$$

$$\text{Evaluation result of teaching implementation: } B_4 = A_4 \times R_4 = (0.719 \quad 0.205 \quad 0.076 \quad 0)$$

$$\text{Evaluation result of teaching effect: } B_5 = A_5 \times R_5 = (0.831 \quad 0.137 \quad 0.032 \quad 0)$$

Further construct a comprehensive evaluation matrix of first-level indicators:

$$R = \begin{pmatrix} 0.713 & 0.182 & 0.102 & 0 \\ 0.795 & 0.114 & 0.091 & 0 \\ 0.764 & 0.203 & 0.033 & 0 \\ 0.852 & 0.124 & 0.024 & 0 \\ 0.812 & 0.073 & 0.115 & 0 \end{pmatrix}$$

The final comprehensive evaluation vector of online teaching quality of foreign students in China can be obtained by combining the first-level index weight above:

$$\begin{aligned} B = A \times R &= (0.0742 \quad 0.2528 \quad 0.1961 \quad 0.0843 \quad 0.3940) \begin{pmatrix} 0.713 & 0.182 & 0.102 & 0 \\ 0.795 & 0.114 & 0.091 & 0 \\ 0.764 & 0.203 & 0.033 & 0 \\ 0.852 & 0.124 & 0.024 & 0 \\ 0.812 & 0.073 & 0.115 & 0 \end{pmatrix} \\ &= (0.795 \quad 0.121 \quad 0.084 \quad 0) \end{aligned}$$

From the final evaluation results of the online teaching quality evaluation for international students in China, it can be seen that 79.5% may be "excellent", 12.1% may be "good", 8.4% may be "pass", and 0% May be "failed". According to the principle of maximum membership, among the four levels of comprehensive membership of "excellent, good, pass, and fail", there are: $0.795 > 0.121 > 0.084 > 0$. Therefore, the comprehensive evaluation result of the online teaching quality evaluation for international students in China as "excellent".

The score of the comment set $V = \{\text{Excellent, Good, Pass, Fail}\}$ is (95 80 60 50), the comprehensive score of online teaching quality for international students in China is:

$$S = (95 \quad 80 \quad 60 \quad 50) \times (0.795 \quad 0.121 \quad 0.084 \quad 0)^T = 90.245$$

DISCUSSION

The research aims to explore the quality of online teaching for international students in China at the university level, and to put forward countermeasures and suggestions on how to improve the quality of online teaching for international students in China under the background of the epidemic. The results show that the online teaching quality of international students in Zhejiang University of Science and Technology is good. In fact, the online teaching model has existed for many years. Before that, there were many online teaching platforms (Li, 2020). However, online teaching has not been fully developed in China and there are various problems, such as network congestion, platform flooding, etc. (Li, 2020; Hu, 2020), so in this respect, continuous improvement is still needed. In addition, the teaching of foreign students is unique compared to domestic students, and during the prevention and control of the new crown pneumonia epidemic, the difficulty and challenges of online teaching are far greater than those of domestic students. How to ensure the quality and effectiveness of online teaching for foreign students It is a major challenge currently facing universities (Xue et al., 2020)

The research still has some shortcomings. It only discussed a certain university in Zhejiang Province, so there is a

problem of regional restrictions. If other scholars want to study similar issues in the future, they can consider expanding the region to make it universal.

CONCLUSIONS AND RECOMMENDATIONS

Based on combing the research results of online teaching quality evaluation at home and abroad and investigating and analyzing the status quo of online teaching for foreign students in China, this paper comprehensively uses the analytic hierarchy process and fuzzy comprehensive evaluation method to evaluate the quality of online teaching for foreign students in China. First of all, from the overall situation, the comprehensive evaluation result of the online teaching quality of international students is "excellent"; but from the results of the questionnaire survey, for online classroom teaching, nearly half of the international students believe that the online interaction between teachers and students is insufficient, and online The Q&A effect is not good, and there are too many or too few homework assignments online, which cannot reflect individual characteristics. In addition, due to differences in geographical and economic conditions, some of the international students who have returned to the country cannot obtain the network required for teaching. A small number of students are reluctant to actively participate in online teaching. Therefore, attaching importance to and guaranteeing the online learning of the international student group is of great significance to education and involves a wide range of content, which requires us to take it seriously and effectively solve it.

Recommendations based on the above results:

1. Resolve jet lag and network issues. The problem of jet lag has become the primary problem faced by international students in online teaching. Teachers can adjust the teaching time so that students can carry out live learning smoothly. In the case that the teaching time cannot be adjusted, the teacher can arrange to watch the live playback video, arrange related tasks for inspection and supervision, and separately arrange time for live Q&A with these students.
2. In view of the network situation, teachers can use other teaching methods to teach, such as WeChat group teaching, teaching content and PPT are placed in the WeChat group as pictures, voice conferences, shortening the class time supplemented by extracurricular homework, etc., to save students' teaching needs.
3. Guarantee the quality of teaching. According to the above results, there are still many shortcomings in online interaction. Teachers should increase interaction with students through a variety of teaching methods to achieve better teaching results; additional online tutoring can be provided after each class Q&A classes to answer students' learning puzzles in a timely manner; do a good job of classifying and personalized teaching plans for students, and the teacher can adjust the corresponding homework according to the actual situation of each student, different time differences, network conditions, specific conditions affected by the epidemic, etc. And increase the amount of open and thoughtful homework assignments, build a flexible curriculum teaching mechanism composed of classroom teaching, independent learning, online assessment, etc., and make it more standardized to meet the needs of online teaching caused by emergencies. It is also the mission of responding to and doing well in this early global learning era.

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