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# Survey Study of the Cultural Integration of International Students in East China under Ecosystem Theory

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Abstract: With the gradual formation of the open pattern of higher education, the issue of the cultural integration of international students has attracted increasing attention. This paper conducts a questionnaire survey of 2000 international students in East China and used factor analysis and structural equation modeling to determine the effects of life adaptation, interpersonal communication, and the training system on cultural integration, with possible moderation by study adaptation to explore the cultural integration of international students. The study found that the cultural integration of international students is jointly affected by multiple realistic factors, among which life adaptation and interpersonal communication are the primary factors. Furthermore, the training system has an important impact on the cultural integration of international students through study adaptation. Accordingly, we argue that universities should strengthen the informal organization and guidance of international students, enhance individual adaptability, promote international exchange, cooperation, and policy regulation of international students, and improve their training system. Moreover, efforts are needed to improve the study adaptability of international students so as to comprehensively address the problem of the cultural integration of international students and improve their education level.

Keywords: international students; cultural integration; ecological systems theory; structural equation



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#### 1. Introduction

With the rapid economic development and increasing proportion of government investment in the internationalization of higher education, the attractiveness of China in the international community in academic circles has gradually increased [1]. By 6 February 2022, China had established educational cooperation and exchange relations with 188 countries and regions and 46 critical international organizations and signed agreements on the mutual recognition of higher education degrees with 54 countries. China has gradually formed an all-dimensional, multi-tiered, and wide-ranging pattern of educational opening-up. To better increase the supply of international public goods for education and provide a Chinese plan for global education governance, the Ministry of Education issued the Opinions on Accelerating and Expanding the Opening Up of Education in the New Era in June 2020, in which it proposes to adhere to internal and external coordination, improve quality and efficiency, take the initiative to lead, and open up in an orderly manner to ensure a more all-round, wide-ranging, multi-level, and active pattern of educational opening to the outside world [2]. However, with the increase in the number of international students in China, the needs of cross-cultural communication have entailed ever stronger requirements for the management of international students, and the problem of the cultural integration of international students has become increasingly prominent. Currently, China's educational system for international students faces the following apparent contradictions. Sustainability **2022**, 14, 14485 2 of 21

#### 1.1. Obstacles in Cross-Cultural Communication

Language is the key to a country's culture, and Chinese presents tremendous challenges to students of Chinese due to its unique and rich web of connotations [3]. In their study of Chinese, international students can master part of the language used in their field, but there remain great difficulties in in-depth semantic understanding [4]. Due to differences in cultural awareness, some international students do not fully understand rules and regulations, resulting in occasional disciplinary violations [5]. Studying abroad is a process of cultural contact and cultural learning. International students in China are both cultural sojourners and learners, and their cultural integration is more challenging and complex than that of ordinary sojourners [6]. From inner discomfort to irritability and anxiety to panic, this is an essential manifestation of cultural conflict and cultural differences [7]. Such insufficient cross-cultural understanding easily causes social barriers for international students, leading to a single social circle and poor communication [8].

#### 1.2. Inadequate Adaptation to Overseas Students' Daily Lives

International students differ from Chinese students regarding the natural environment, human geography, and living habits [9]. For example, Central Asian residents are used to eating different cold foods, religious people do not eat many Chinese foods, and nomadic students from Central Asia are more used to sleeping on the ground or the kang (the heated platform in northern Chinese homes). Students from tropical Southeast Asian countries do not readily adapt to the northern noodle. Medical services for international students in Europe and the United States tend to make appointments. These differences in daily life will cause a certain degree of difficulty in adaptation among international students in the face of problems such as excessive food condiments in university canteens [10].

#### 1.3. The Need to Optimize and Improve the Education Model and Quality of International Students

Currently, Chinese educational institutions have almost the same training mode for international and domestic students. However, students from many countries are mainly influenced by western academic concepts before they come to China. After receiving the influence of open and exploratory education in their home countries, they do not find it easy to adapt to the teaching requirements of Chinese colleges and universities, including single teaching, strict examinations, and consistent work schedules [11,12]. In domestic colleges and universities, classroom teaching mainly relies on the method of instillation, and the differences in classroom communication, such as inactive and passive language expression, cause difficulties in the adaptation of international students to Chinese university studies. At the same time, international students from some countries pay great attention to academic achievement and research levels. Still, at present, most universities find it difficult to achieve balanced development in terms of the international students' tutor allocation, academic research level, research platform, data sharing, and systematic Chinese learning [13,14]. This situation may lead to low academic performance, poor professional skills, and poor in-depth language communication, which will hurt the highquality employment of international students and the level of international teaching in Chinese universities [15].

#### 1.4. The Management of International Students Still Needs to Be Improved

Due to the particularity of international students, there are many challenges in standardized management: the quality of international students is uneven, the training process for international students is relaxed, assessment difficulty is not great, and extensive teaching management will adversely affect the global status and reputation of Chinese higher education [16]. Regarding daily management, logistics and administrative departments have shown problems in denying requests and preferential treatment in handling affairs for international students due to poor language communication, among other factors [17].

In conclusion, this study aims to understand these problems according to Bronfenbrenner's ecosystem theory from the perspective of culture regarding the distinct features

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of international students' education evaluation system. The investigation team designed a questionnaire and tested the elicited data to determine the factors and weights affecting the cultural integration of international students and suggest feasible measures to accelerate the cultural integration of international students in China.

# 2. Hypotheses and Measures

2.1. Literature Review

# 2.1.1. Review of the Theory of Cultural Integration

The research on cross-cultural integration first appeared in the field of anthropology in the 1930s, resulting in several different theories and models of cross-cultural integration in different fields. Lysgaard proposed the "U-curve" theory after summarizing the acculturation of scholars in the United States [18]. On this basis, Kalvero Oberg proposed the concept of a cultural shock, considering the process of individual psychological feeling change [19]. The "cross-cultural adaptation model" proposed by Berry distinguishes four types of acculturation (integration, separation, assimilation, and self-marginalization). The scholars then added the cross-cultural adaptation of scholars from two aspects of psychological adaptation and sociocultural adaptation and proposed the "acculturation process model" [20]. In addition to the introduction and reference of the above well-known model theories of cultural integration with far-reaching influence, some domestic scholars also put forward new models. An Ran proposed the concept of international students in the inner cultural layer by studying changes in their sensitivity and the effects of external sensors, thereby enriching the theoretical models of research on the cultural integration of international students [21].

By comparing Chinese and foreign literature on the cultural integration of foreign students, we find that the initial stage of research mainly starts with the individual researchers focusing on individual feelings and psychological adaptation. The second stage of research focuses on the external environment, largely at the level of social life. In the third stage, research investigates the overall adaptation of the external environment to the psychological and academic adaptability of international students and studies the cultural integration of international students as a whole. However, due to the different national conditions, with the further internationalization of higher education in China, the development of China's education policy for international students and the education and training system for international students in universities cannot be ignored. The above-mentioned issues concerning individual communication, life adaptation, the educational model and quality of education, management norms, and other aspects in the process of cultural integration of international students remind us that the importance of the international student training system cannot be ignored. However, given the lack of research considering all the factors and the theoretical model of associated factors as a whole, this study addresses the previous section in the process of culture by dividing it into several important problems and applies the theory of ecosystem culture with the research theory model from the perspective of international students.

#### 2.1.2. Review of Ecosystem Theory

In the 1980s, Bronfenbrenner put forward the theory of social ecosystem [22], which emphasizes that the development individual is nested in a series of mutually interacting environmental systems, and the environment and the individual interact and affect individual development. In his human development situation of 1979, he proposed four dimensions (microsystem, mesosystem, outer system, and macro system) that affect the growth process of children, where each system interacts with the others and with children, leading to different levels of development in children [23]. Interventions in children's development level through a variety of methods can help them better solve problems in the whole ecological environment and integrate into society more quickly [24,25]. Because ecology provides a unique perspective and method for the study of the impact of individual organisms, after Bronfenbrenner introduced ecological knowledge into the study of individual

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ual human behavior, a large number of scholars made innovations and extensions based on the ecosystem theory that have also been widely used in research in fields such as sociology and psychology [26–29]. Talent ecology proposes to study the relationship between talent, the natural environment, and the social environment through ecological methodology and to make full use of resources to maximize the ecological function of the environment system to which talent belongs. Similarly, some scholars established a comprehensive talent ecological environment evaluation index system based on the ecosystem theory [30]. In "Ecological Human Resource Management", in the three-dimensional Internet network environment, the role of individuals is equally as important as it is in the environmental system. Jiang Yi proposed to apply ecosystem theory to study the study, life, and cultural integration of international students from micro-, meso-, and macro-perspectives, positing that the ecological environment of international students can be adjusted to promote the integration of foreign students into the university [31].

It is not hard to find applications of the ecological system theory to the behavior and development of the individual affected by the environment regarding the multiple combinations of the argument. Thus, in using the ecological system theory, this paper delimits the factors in international students' culture system and establishes a new system of environmental indices to evaluate the international student culture ecosystem environment as follows:

Microsystem: the life adaptation and interpersonal communication between the individual international student and the international student in the direct contact environment.

Mesoscopic system: academic adaptation, which is closely related to the various microenvironments in which international students develop.

Appearance system: a training system in which international students are not directly involved but that has a profound impact on their development.

Macrosystem: the cultural integration that affects the social environment of international students, including the subcultural environment of the entire body of international students.

## 2.2. Indices Adopted

#### 2.2.1. Life Adaption

Bronfenbrenner's ecosystem theory [23] posited that the closest contact with children and the most direct living environment are the microsystems that constitute children's growth. Children undergo a series of psychological and physiological feedback processes directed toward the microenvironment, so when international students meet the new environment of studying abroad, they ensure the satisfaction of the living environment, pace of life, and living habits. In a given situation, the living environment of international students considers the comfort of the natural environment and the safety of the social environment. The stability of social life and a sense of security are essential for international students to adapt to life [32,33]. The pace of life refers to the impact of economic development and infrastructure on international students [34]. Living habits include whether students adapt to China's daily lifestyle of transportation, communication, shopping, eating, convenient Internet payment, and environmental protection [35].

# 2.2.2. Interpersonal Communication

In the microsystem as viewed by Bronfenbrenner [23], it is not difficult to find that parents and teachers in close contact with children are essential organizational factors. Because they follow the principle of two-way interaction with children and influence each other in language behavior, the three indicators of friendship interaction, language communication, and value orientation can be used to measure the interpersonal communication of international students. Communication between teachers and students on campus and social communication off campus can give international students a more intuitive experience of Chinese culture and local customs [36]. Language communication includes the language attitude, motivation, and pragmatic ability of international students [37]. Language at-

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titude refers to international students' understanding and evaluation of the social value of a language driven by social identity and emotion. Language motivation refers to the purpose and deeper intentions of international students when they use Chinese. Pragmatic competence is divided into the language ability to understand and use Chinese forms to implement Chinese behavior and the social ability to understand the social environment in which language is used to implement language behavior [38]. On the one hand, values are reflected in the differences in individual religious beliefs of international students; on the other hand, they are reflected in the influence of native language habits on the Chinese language of international students, because when international students express emotions through such means as requests, suggestions, thanks, and apologies in the second language of Chinese, a positive or negative value is transferred to the home language and culture [39,40].

# 2.2.3. Study Adaptation

In The Ecology of Human Development [23], Bronfenbrenner mentioned that the environment to which children are directly exposed is interconnected, and the quality of this connection affects the adaptation and development of children. The study adaptation relationship is the primary relationship faced by international students, which can be measured by three indicators: classroom learning, after-class discussion, and the teacherstudent relationship. Classroom learning refers to environmental factors such as classroom rhythm, in-class communication, teaching content, teacher-student interaction, and course characteristics in colleges and universities [41,42]. The discussion after class involves three perspectives: student discussion, teacher discussion, and teacher-student discussion. Discussion among students requires autonomy and initiative; discussion among teachers can be carried out through multiple dimensions such as annual index assessment, department transfer, and participation in international projects. The tutor can lead the teacher-student discussion to conduct professional project team training, and appropriate international student awards can be given to promote the whole team's development toward internationalization and specialization [43]. Regarding the performance of the teacher-student relationship, international students mainly communicate with their teachers, tutors, logistics service teachers, and administrative management teachers. A harmonious teacher-student relationship facilitates international students in understanding the teaching content and tasks and promotes their academic mastery [44].

#### 2.2.4. Training System

Bronfenbrenner [23] pointed out that children's growth and development are influenced by both formal and informal organizations, which either support or restrict children's development. As an appearance system for the development of international students, the organizational elements of the global student training system are mainly analyzed from the perspectives of teaching content, management mode, and education quality [45]. Teaching content refers to the knowledge system of teaching for international students, that is, the rationality of the division of the course content system, the scientific design of media, the perfection of the selection of knowledge points, and the richness of teaching language. The management mode involves the dormitory manager, logistics, entrance, scholarship, and aspects of Internet media [46]. The quality of education is of great significance in improving China's internationalization education status. First, we must consider the quality; second, the teacher-student ratio of higher education in China; and third, the proportion of higher education expenditure in total government expenditure. The teaching quality also needs to consider the tutor's study achievements, the university teachers' foreign language ability, the school curriculum system arrangement, the school scale, and other factors. Among these, the international language preparatory course can effectively capture policy-driven talent opportunities in China and improve the quality of the employment export of Chinese students [47,48].

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#### 2.2.5. Cultural Integration

As a macrosystem, the cultural integration of international students involves observing the social environment, characteristic festivals, traditional culture, and other ideological indicators. In Bronfenbrenner's view, macrosystems concern what to teach children and what to make them. In this study, social environment refers to the cultural exchange atmosphere in the life circle of international students on the one hand and the influence of the cultural migration of the home country on the other [49]. Characteristic festivals are the epitome of a country's excellent traditional culture. The degree of understanding, love, and participation of international students in distinct festivals reflects the degree of their acceptance of Chinese culture [50]. Because of the continuous history of development of the country, Chinese traditional culture is unique, first of all in language and culture. For international students whose native cultural background is far from the Chinese cultural background, attention should be paid to the guidance and teaching of language communication and culture to avoid unnecessary conflicts and misunderstandings in language communication and culture [51,52]. Next are food, morality and behavior, history, architecture, crafts, and other cultural elements [53,54].

According to the follow-up results of international students in some universities in East China, a comfortable and safe living environment and stable social security can improve the sense of social integration of international students, increase their expectations of local festivals and traditional activities, and strengthen their enthusiasm for Chinese traditional culture. Because the living environment and habits are involved in life adaptation, this paper posits the following hypotheses.

#### **H1.** *Life adaptation has a significant impact on cultural integration.*

Our literature review found that improving the Chinese language level of international students can effectively help them understand and learn Chinese culture. Dating parties can intuitively convey the behavioral culture of Chinese social interaction, and in-depth communication can promote the superficial adaptation of international students to Chinese spiritual culture. Because interpersonal communication includes dating parties, language communication, and other aspects, this paper proposes the following hypothesis.

# H2. Interpersonal communication has a significant impact on cultural integration.

Researchers have shown that education and culture are inseparable and interwoven. If the curriculum content for international students is scientific and perfected and the language is rich and professional, it can effectively improve the learning and mastery of Chinese culture of international students. Considering the strong adsorption effect of the scholarship system and internationalization level of universities on international students, the featured curriculum will export Chinese characteristic culture to the greatest extent. Because the training system includes teaching content, education management quality, and other contents, this paper accordingly advances the following hypothesis.

#### **H3.** *The cultivation system has a significant impact on cultural integration.*

After a thorough understanding of the specific classroom performance of international students in China, it is found that teachers' good professional skills and efficient classroom expression are the most important forms of cultural output that can increase the interaction between teachers and students, promote international students' quick grasping of knowledge, and enhance their sense of accomplishment and sense of belonging. After-class group practice and discussion activities can provide more opportunities for contact and communication with local people and accelerate the integration of international students into local social life. Because teacher–student interactions and after-class discussions are involved in academic adaptation, this paper proposes the following hypothesis.

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#### **H4.** Academic adaptation has a significant impact on cultural integration.

Earlier research found that international students do not adapt to the unfamiliar living environment in the initial stage of studying abroad and are prone to friction and misunderstanding with other students. Some students will have strong psychological confusion and resistance when their social needs are not satisfied, which makes them unwilling to actively make friends and discuss matters with classmates, and they do not actively communicate with teachers when they encounter problems. This hinders international students' academic adaptation, because taking the initiative to accept and integrate into the new cultural environment is the foundation for international students to further improve their academic performance. Accordingly, this paper proposes the following hypothesis.

#### **H5.** *Life adaptation has a significant impact on academic adaptation.*

Through the follow-up of international students, it is found that interpersonal communication is the first step for international students to carry out other social activities. Looking for like-minded friends in a foreign country is a collision of different values, such as efficient conversation between teachers and students, professional communication between classmates, interesting travel between friends, and witty Q&A with local residents. These interpersonal interactions help international students experience the fun of learning, eliminate the gap between country and skin color, and enhance learning efficacy and self-learning value. Accordingly, this paper proposes the following hypothesis.

#### **H6.** *Interpersonal communication has a significant impact on academic adaptation.*

The training system is the basic guarantee for international students' academic adaptation. It is easy to find that the number of campuses and majors receiving international students is increasing, and the frontline teacher groups that are in line with international education are growing. The quality of higher education in China is constantly improving, and bilingual teaching improves the efficiency of foreign students' absorption of professional knowledge. The coexistence of convergence management and difference management not only takes into account the individual needs of international students but also facilitates the promotion of friendship between students and cultural integration. Accordingly, this paper proposes the following hypothesis.

### **H7.** The training system has a significant impact on academic adaptation.

The initial model constructed according to the above assumptions is shown in Figure 1.

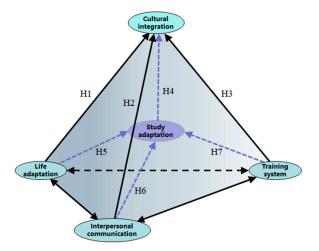


Figure 1. Structural diagram of the study hypothesis.

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#### 3. Research Design

In order to verify the above hypothesis and explore the relationship between potential variables and observed variables, this paper formulated a cultural integration questionnaire for international students in China, with international students in China as the research object and academic adaptation as the mediating variable.

# 3.1. Sampling and Questionnaire Distribution

#### 3.1.1. Scale Selection

This research combines quantitative research based on a questionnaire survey and qualitative research based on interviews. The questionnaire consists of two parts. The first part investigates the basic information about international students such as gender, age, and education level. The second part is based on the paper questionnaire made by Glas Saskia [55], Akaliyski [56], and other researchers, combined with knowledge of the reality of international students in China in recent years, from which 15 questions were prepared about the cultural integration of international students that mainly concerned the five dimensions of international students' life adaptation, interpersonal communication, training system, academic adaptation, and cultural integration. The scale was based on the Zung Depression Self-Scale, developed by W. K. Zung of Duke University in the United States, with changes to better measure the subjective feelings of international students [57]. At the same time, we referred to Ward and Kennedy's scale for sociocultural adaptation. According to the literature review and interview investigation, we deleted some items that are less relevant to international students and combined the remainder with the scales improved by Chinese scholars Qi Jinyu [58] and Zhang Chunmei [59] to produce the fivedimension scale used in this study. In the process of making the scale, we solicited the suggestions of teachers from the foreign language schools of some Chinese universities and experts in the field of international students, which improved the scientific character and completeness of the scale. In addition to the four basic information questions in the formal questionnaire, the items to measure the attitudes and tendencies of the surveyed foreign students, including items for the training system (3 questions), life adaptation (3 questions), academic adaptation (3 questions), interpersonal communication (3 questions), and cultural integration (3 questions), were scored on a 5-point Likert scale from strongly disagree (1 point), disagree (2 points), unsure (3 points), and agree (4 points) to strongly agree (5 points). See Table 1 for details.

**Table 1.** Survey scale of international students' cultural integration in China.

Latent Variable		Observed Variable	Explanation of Indicators
Life Adaptation (LA)	LA1 LA2 LA3	Living environment Pace of life Living habits	Safe, comfortable, and stable Local socioeconomic development and living standards Food, shopping, transportation, communication
Interpersonal Communication (IC)	IC1 IC2 IC3	Making friend party Language communication Values	Campus integration and social exchange Language attitude motivation; pragmatic choice Religious belief, value transfer
Training System (TS)	TS1 TS2 TS3	Teaching content Management mode Quality of education	Rationality, scientificity, perfection Housemaster, logistics, scholarship Academic achievements, foreign language ability, curriculum system
Study Adaptation (SA)	SA1 SA2 SA3	Classroom learning After-class discussion Relationship between teachers and students	Teaching content, teacher–student interaction Initiative, diversity, professionalism Teaching, administration
Cultural Integration (CI)	CI1 CI2 CI3	Social environment Special holidays Traditional culture	Cultural exchange atmosphere Know, love, participate Food, thought, history

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## 3.1.2. Sampling Design

This study adopts a combination of non-probabilistic sampling and simple random sampling. In the first step, five prefecture-level cities in East China were randomly selected as the first-level sampling units. In the second step, 14 universities from 5 prefecture-level cities were randomly selected as secondary sampling units. In the third step, each grade of the 14 universities was used, resulting in a three-level sampling unit. In the fourth step, students from each class were randomly selected as the final sampling unit.

Applying the formula for the minimum necessary sample size  $N = Z^2 \times [p(1-p)/E^2]$ , with a confidence level of 95% (Z = 1.96), error value E = 5%, and the probability value p = 0.5, yielded a minimum sample size N = 384. Due to the wide scope and solid economic development foundation of East China, the number of international students in colleges and universities was sufficient. In order to ensure the comprehensive, scientific, and representative character of the survey and considering the possibility of invalid questionnaires in the actual survey, the survey team distributed  $400 \, (400 > 384)$  questionnaires in each of the five prefecture-level cities of the first-level sampling units to a total of 2000 international students.

#### 3.1.3. Quality Monitoring

Quality control is the prerequisite to ensure the validity of data and the key to the analysis of conclusions. Therefore, strict quality control must be carried out at every step of the study.

# Quality control of the investigators

The research group selected students who were conscientious and responsible to participate in the survey and gave simple training to all investigators to familiarize them with and help them correctly understand the content of the questionnaire, in order that they could help the respondents to correctly understand the questions and answer them objectively. After the preliminary investigation and several study group meetings, the investigators were again familiarized with the investigation procedures and contents.

#### Quality control of the questionnaire design

The questionnaire was entirely constructed by the researchers and followed strict design procedures and principles. In order to ensure the feasibility of the questionnaire, we administered the trial survey to 50 subjects in each of two batches to identify any shortcomings of the questionnaire design, allowing us to modify and demonstrate the feasibility of the questionnaire, thereby ensuring its credibility.

# Quality control in the field research stage

The survey was conducted in the form of an oral inquiry and a self-completed questionnaire. After each respondent completed the questionnaire, the investigator took it back on the spot. The investigators were instructed to check the answers of the respondents, find problems in a timely fashion, check any gaps, seek to ensure the accuracy and completeness of the questionnaire answers, and ensure the quality of the questionnaire with maximum validity. Through a manual review of the collected questionnaires, adjustment, and elimination of missing items and invalid questionnaires, 1520 questionnaires were finally deemed valid, for a questionnaire recovery rate of 76%.

# Quality control of the collected data

The data from the 1520 valid questionnaires collected by the research team were checked with SPSS 26.0 by drawing frequency histograms of the data distributions, and the results showed that the data were all in line with a normal distribution.

# 3.2. Participants' Demographic Characteristics

The demographic characteristics of the sample mainly include basic information such as the gender, age, education level, and major of the overseas students in China (Table 2).

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Variable	Variable Definitions	Frequency	Percentage	Variable	Variable Definitions	Frequency	Percentage
Gender	Male	806	53%	Age	25 years and under	745	49%
	Female	714	47%	O	26–55 years	775	51%
	Literature and History	593	39%	Education	Undergraduate	532	35%
Major	Science and Technology Agricultural Medicine	426 501	28% 33%	Level	Postgraduate and above	988	65%

Table 2. Participants' demographic characteristics.

The proportions of men and women in the sample were 53% and 47%, respectively. The age distribution is relatively balanced, and the most common field is literature and history, followed by agriculture and medicine, while relatively few foreign students majored in science and technology. The education level of international students is generally high, and most of them had chosen to receive postgraduate education or higher in China.

#### 3.3. Questionnaire Analysis

SPSS software version 26.0 (IBM Corp. Released 2019. IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY, USA: IBM Corp) was used for statistical analysis. First, the total scores of the samples were sorted in ascending order, and the top 3% of the scores were classified as the low groups. The model with the lowest 3% of the scores was considered the high group, and then the extreme values were compared. The independent-sample t-test was then conducted, and it was found that the SIG values of the mean equation were all less than 0.005, indicating that there were significant differences between the low group and the high group for all variables, which was in line with the actual situation. On this basis, the author conducted the homogeneity test for each item.

#### 3.3.1. Reliability Test

In this study, the internal consistency method was used to test the reliability of variable measurement, and the reliability analysis was conducted on the questionnaire items. The Cronbach's alpha coefficient of the measured variables was calculated to be 0.836, higher than the threshold value of 0.7, indicating that the scale was highly credible.

#### 3.3.2. Validity Test

Validity is the degree to which the measurement results reflect the desired content, and it is divided into content and construct validity. To verify that the scale met the requirements of content validity, the author referred to a large body of theory and research, consulted teachers of education in universities and teachers at foreign language schools, and closely considered the facts on the ground. The consensus was that what the questions measured and the indicators of the questionnaire were the same. In this study, factor analysis was used to analyze the construction validity of the scale, and the Kaiser–Meyer–Olkin (KMO) test and Bartlett sphericity test were used to check the appropriateness of the factor analysis. The KMO value of the scale was 0.811 (>0.8), which was close to 1, indicating that the sample size met the requirements, and the data were suitable for factor analysis. The significance level of Bartlett's sphericity test was p = 0.000 < 0.01, indicating a meaningful relationship between the original variables. In conclusion, the questionnaire has good reliability and validity and can be effectively used to investigate the cultural integration of international students.

# 3.3.3. Principal Component Analysis

Factors with eigenvalues greater than 1 were extracted through principal component analysis to achieve the clustering of each dimension of cultural integration of international students in China. SPSS 26.0 extracted five common factors (Table 3), and the cumulative

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> variance contribution was 77.267%. These factors can thus be considered valid groupings that explain the 15 indicators affecting the cultural integration of international students. According to the content of each factor, the five principal component factors were labeled training system, cultural integration, study adaptation, interpersonal communication, and life adaptation. The component matrix and the names of each factor after output rotation are shown in Table 3.

International Students' Cultural Integration	Elamant .			]
Factor (Dimension)	Element	1	2	
	TS1	0.872	0.113	
Tarining Continue	TCO	0.066	0.1.11	

**Table 3.** Component matrix after rotation.

**Factor** 3 4 5 0.161 0.174 0.089 0.039 0.1410.212 0.15 Training System TS2 0.866TS3 0.7920.1850.157 0.012 0.142 CI1 0.8 0.053 0.035 0.087 0.141 CI2 0.022 0.158 Cultural Integration 0.1850.776 0.237 CI3 0.395 0.274 0.628 0.129 0.166 SA1 0.135 -0.0420.822 0.048 0.149 Study Adaption SA2 0.257 0.261 0.704 0.062 0.094 SA3 0.154 0.255 0.697 0.198 -0.132IC1 -0.0560.722 0.063 0.121 0.181 0.095 **Interpersonal Communication** IC2 -0.0180.281 -0.0970.706 IC3 0.26 0.086 0.281 0.659 0.103 LA1 0.042 0.052 0.109 -0.0990.803 Life Adaption LA2 0.0290.083 -0.0810.394 0.588 LA3 0.236 0.192 0.572 0.1780.052Eigenvalues 3.879 2.223 2.208 1.996 1.684 Percentage of variance 18.529 16.949 15.405 13.931 12.453 18.529 35.478 50.883 64.814 77.267 Cumulative percentage

#### 4. Empirical Analysis

A formal scale with reliability and validity based on 1520 valid surveys was obtained through theoretical model construction and principal component analysis. The structural equation was used to analyze the factors affecting the cultural integration of international students, to study how environmental variables affect the cultural integration of international students through study adaptation, and to analyze the moderating effect of mediating variables. Finally, the revised model and influence path were obtained.

# 4.1. Structural Equation Model (SEM)

The cultural integration of international students studied in this paper is an individual subjective understanding, which is difficult to observe directly. Structural equation models allow latent variables to be inferred from multiple observed variables and can simultaneously test the causal relationship between numerous latent variables. Structural equation models are generally composed of measurement models and structural models. The former represent the relationship between observed and latent variables, while the latter reflect the relationship between latent variables.

#### 4.2. Model Fitting and Path Analysis

#### 4.2.1. Hypothesis Model

Amos 28.0 (IBM Corp. Released 2021. IBM Amos Graphics for Windows, Version 28.0. Armonk, NY, USA: IBM Corp) was used for structural equation model fitting and path analysis in this study. According to the theoretical model, SEM is used to study the main model structure for the environmental variables, study adaptation, and cultural Sustainability **2022**, 14, 14485 12 of 21

integration. Study adaptation was the mediating variable, cultural integration was the dependent variable, and the environmental variables acted on cultural integration with study adaptation as the mediating variable. According to the test of empirical data and the adjustment of the model, the standardized path coefficient model of international students' cultural integration was shown in Figure 2.

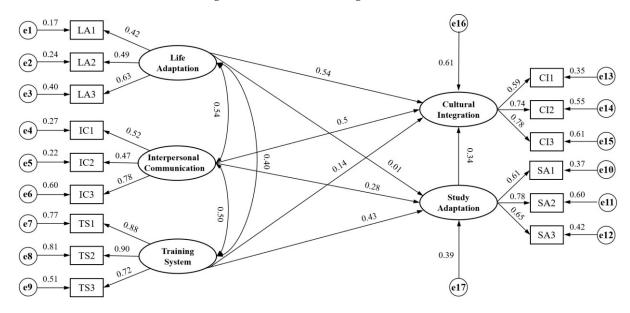


Figure 2. Structural equation model diagram for initial assumptions.

In the SEM test of an overall model, confirmatory factor (CFA) analysis should be carried out for each variable in order to ensure the reliability of the overall model. In this paper, confirmatory factor analysis was carried out for each dimension during the structural validity test of the formal scale, and the analysis structure is good. The standardization results of the initial hypothesis structural equation model are shown in Table 4.

	test of the formal scale, and the analysis f the initial hypothesis structural equation	O	
Table 4. T	est results of each factor of the initial model	fitness.	
Statistical Test Volume	Adapted Standard or Critical Value	Measurement M	odel
X <sup>2</sup>	p < 0.05 (significant)	120.127 (p = 0.002 < 0.05)	qualified

Adapted Standard or Critical Value	Measurement Model		
p < 0.05 (significant)	120.127 (p = 0.002 < 0.05)	qualified	
<3.00	1.502	qualified	
< 0.08	0.05	qualified	
>0.90	0.931	qualified	
>0.90	0.897	unqualified	
>0.90	0.956	qualified	
>0.50	0.673	qualified	
>0.50	0.621	qualified	
>0.90	0.883	unqualified	
>0.90	0.943	qualified	
	<3.00 <0.08 >0.90 >0.90 >0.90 >0.50 >0.50 >0.90	p < 0.05  (significant) $120.127  (p = 0.002 < 0.05)$ $< 3.00$ $1.502$ $< 0.08$ $0.05$ $> 0.90$ $0.931$ $> 0.90$ $0.897$ $> 0.90$ $0.956$ $> 0.50$ $0.673$ $> 0.50$ $0.621$ $> 0.90$ $0.883$	

As can be seen from the chart, as the values of NFI = 0.883 and AGFI = 0.89 are less than 0.9, they do not meet the parameter requirements. The comparison of the parameter results shows that the fitting degree of the research model of the influence of foreign students' cultural integration in general needs to be modified.

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#### 4.2.2. Model Modification

In this paper, the method of increasing collinearity between residuals and other indicators is used to improve the degree of fit. The standardized path diagram obtained after the second correction (Figure 3) is as follows:

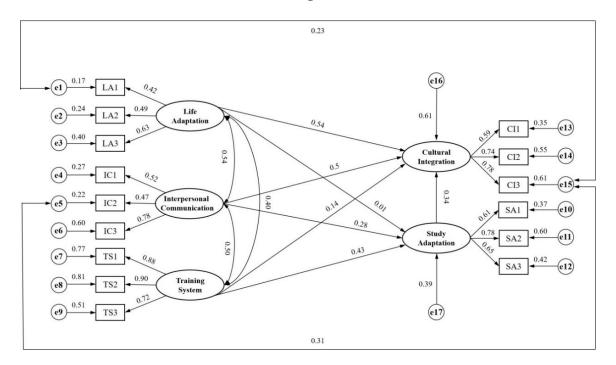


Figure 3. Model diagram after secondary correction.

The specific modification process is realized by observing the output results for the modification indices (MIs). Amos 28.0 returned a highest MI value of 11.626 for e5 and e15, showing that the chi-square value of the model will be reduced by 11.626 if the correlation path between the residuals of the obvious variables IC2 and CI3 is increased. Theoretically, poor language communication can easily lead to a deviation in international students' understanding and application of traditional Chinese culture. Therefore, enhancing foreign students' language learning has a positive effect on their understanding of traditional cultural connotations; thus, it is feasible to increase the related paths of e5 and e15. Returning to the MI values, the next maximum MI value is 7.039 for e3 and e15; thus, by increasing the correlation path between LA1 and CI3, the chi-square value will decrease by 7.039. In theory, adaptation to their living environment is an important part of international students' life adaptation. When international students deal with the problems of adapting to their living environment, they will improve their understanding of Chinese culture and experience more cultural exchanges. Therefore, it is feasible to increase the related paths of e3 and e15.

#### 4.2.3. Model Checking

The model adaptation value after the second correction also changed accordingly, as shown in Table 5.

It can be seen from Table 5 that all parameters meet the discrimination criteria. Comparing the contents of Tables 4 and 5, we see that after the second revision, all indicators of the model fit of the study on the influence of cultural integration have been improved. Therefore, the model has a good fit, which can be further studied regarding the cultural integration of international students.

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Tab1	le 5	5. I	Mο	del	fitness	test resu	lts af	ter mod	lification.

Statistical Test Volume	Adapted Standard or Critical Value	Measurement M	odel
X^2	p < 0.05 (significant)	99.995 ( <i>p</i> = 0.047 < 0.05)	qualified
Chi-square degree of freedom ratio	<3.00	1.282	qualified
RMSEA (root mean square error of approximation)	< 0.08	0.037	qualified
GFI (goodness-of-fit index)	>0.90	0.940	qualified
AGFI (adjusted goodness-of-fit index)	>0.90	0.908	qualified
CFI (comparative fit index)	>0.90	0.976	qualified
PNFI (parsimonious normed fit index)	>0.50	0.670	qualified
PGFI (parsimonious goodness-of-fit index)	>0.50	0.611	qualified
NFI (norm fit index) TLI (Tucker–Lewis index)	>0.90 >0.90	0.903 0.968	qualified qualified

#### 4.2.4. Model Results

#### 1. Analysis of Standardized Path Results

It can be seen from the standardized path analysis results (Table 6) that the estimated value of life adaptation and study adaptation on the path of cultural integration is significant; the CR value is greater than 1.9, p = 0.002 < 0.05, and both are positive. The CR value of the effect of interpersonal communication and training system on study adaptation met the threshold of 1.96, p = 0.045 < 0.05, and the standardized estimate value was significant. Therefore:

Table 6. Path-effect relationships between the independent, intermediate, and dependent variables.

	Pat	th	Estimate	SE	CR	p
Cultural Integration	$\leftarrow$	Life Adaption	0.492	0.175	3.001	0.003
Cultural Integration	$\leftarrow$	Interpersonal Communication	-0.078	0.118	-0.575	0.565
Cultural Integration	$\leftarrow$	Training System	0.183	0.097	1.732	0.083
Cultural Integration	$\leftarrow$	Study Adaption	0.356	0.121	2.847	0.004
Study Adaption	$\leftarrow$	Life Adaption	0.009	0.143	0.073	0.942
Study Adaption	$\leftarrow$	Interpersonal Communication	0.281	0.123	2.058	0.040
Study Adaption	$\leftarrow$	Training System	0.434	0.102	3.998	***

Note: \*\*\* *p* < 0.01.

H1 "Life adaptation has a significant positive impact on cultural integration" is valid.

H4 "Study adaptation has a significant positive impact on cultural integration" is valid.

H6 "Interpersonal communication has a significant positive impact on study adaptation" is valid.

H7 "The training system has a significant impact on study adaptation" is valid.

The CR values of H2, H3, and H5 are all less than 1.96, and the p-values are all greater than 0.05. These three hypotheses are thus rejected.

#### 2. Analysis of the Mediating Effect of Study Adaptation

The path coefficients above cannot directly analyze whether the life adaptation, interpersonal communication, and training system of international students play a role in cultural integration through study adaptation. Therefore, the bootstrap algorithm in Amos 28.0 was used to test the mediating effect of study adaptation. To ensure the stability of the test results, 2000 samples and 95% confidence intervals were set for the test. If the 95% confidence interval of the path coefficient does not include 0, study adaptation can be

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considered to have a mediating effect on cultural integration. The test results are shown in Table 7.

n .1		<b></b>	95% Confide		
Path	Estimate	SE	Lower	Upper	p
M1	0.004	0.245	-0.273	0.136	0.870
M2	0.058	0.344	-0.021	0.703	0.083
M3	0.141	0.128	0.029	0.457	0.012

M1 Life adaptation  $\rightarrow$  study adaptation  $\rightarrow$  cultural integration

M2 Interpersonal communication  $\rightarrow$  study adaptation  $\rightarrow$  cultural integration

M3 Training system  $\rightarrow$  study adaptation  $\rightarrow$  cultural integration

According to the mediating effect test results, the p-value of M3 is 0.012 < 0.05, so the training system can impact cultural integration through study adaptation. In the direct effect test, the 95% confidence interval of the path coefficient of the training system is [-0.195,0.496], containing zero, so the training system cannot directly impact cultural integration. In other words, study adaptation has a full mediating effect on cultural integration.

# 3. Difference Analysis of Social and Demographic Factors

The difference analysis mainly focuses on demographic variables to study the influence of gender, age, education level, and other factors on the cultural integration of international students. SPSS 26.0 software was used to analyze the variables with an independent-sample *t*-test for the influence of gender and age and a one-way variance (ANOVA) analysis for the impact of education level on cultural integration.

(1) Gender and Age. The independent-sample *t*-test was used to analyze the influence of gender and age. The analysis results are shown in Table 8. The significance level of international students' gender on cultural integration is 0.915. The significance level of the age of international students in China on cultural integration is 0.722. As this greatly exceeds 0.05, the null hypothesis of the independent-sample *t*-test is accepted. That is, there is no significant difference between international students' gender and age on cultural integration.

**Table 8.** Independent-sample *t*-test of gender and age in cultural integration.

Va	riable	<b>Cultural Integration</b>	T	p
Gender	Male Female	$\begin{array}{c} 4.0749 \pm 0.64984 \\ 4.0394 \pm 0.64857 \end{array}$	0.378	0.915
Age	18–25 years 26–55 years	$\begin{array}{c} 4.0000 \pm 0.68638 \\ 4.1262 \pm 0.60700 \end{array}$	-1.392	0.722

#### Education level

As shown in Table 9, the significance is 0.031 < 0.05, indicating that the education level of international students in this study is associated with a significant difference in cultural integration.

**Table 9.** ANOVA test of education level on cultural integration.

	Cultural Integration			
Education Level ——	Mean	Standard Deviation		
Undergraduate	4.0509	0.64437		
Postgraduate and above	4.0677	0.65232		
F		0.031		

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#### 5. Conclusions

5.1. The Cultural Integration of International Students Is Jointly Affected by Multiple Real-Life Factors

The results show that life and study adaptation have positive and significant effects on the cultural integration of international students. Both interpersonal communication and training systems have a positive and significant impact on international students' study adaptation. The training system has a positive and significant impact on the cultural integration of international students through study adaptation. One-way analysis of variance showed that education level had a significant positive impact on the cultural integration of international students. It can be seen that the cultural integration of international students is jointly affected by the individual and the entire ecological environment of the individual. To better promote the cultural integration of international students, on the one hand, it is necessary to improve the adaptive ability of international students; on the other hand, it is essential to enhance the education and training system of international students and improve the quality of students.

5.2. Life Adaptation and Interpersonal Communication Are the Basic Factors for International Students' Cultural Integration

Studies show that an appreciation of living habits is essential to international students' study adaptation and an important factor affecting their cultural integration. Living habits are the epitome of a region's social environment and traditional culture and the external expression of its historical development. Therefore, when international students are curious about the living habits of the residents of the destination and try to learn and practice them, they will come to understand the values reflected in the habits and the cultural connotations behind them to some extent. Values are also the basis of interpersonal communication. When the values of international students and Chinese teachers and students are better aligned regarding an issue, they will be encouraged to communicate more, which will make the relationship between students and teachers harmonious and further deepen the students' degree of cultural integration. A balanced campus relationship will enhance the confidence of international students to deal with interpersonal affairs and positively impact their life adaptation.

5.3. The Major Impacts of the Training System on the Cultural Integration of International Students through Study Adaptation

This study has shown that the education content, management mode, and education quality all have a major impact on the training system of international students. It can be seen that the education management mode and the overall quality of higher education significantly impact international students' adaptation to a campus. The comprehensive and scientific education management system can effectively promote communication between teachers and students, improve the academic level of international students, enhance the confidence of the potential group of international students in Chinese education, and encourage more international youth to study and participate in cultural exchanges in China. By improving the curriculum for international students, strengthening the global construction of university teachers, and promoting the convergence of social and school management, we can create a convenient and scientific appearance system environment for international students, which will play a positive role in international students' academic achievements, social environment, and integration into traditional culture.

#### 6. Suggestions

6.1. Pay Attention to Informal Organization Guidance and Enhance the Individual Adaptability of International Students

Measures should start with the essential role of international students' life adaptation and interpersonal communication in cultural integration. Regular mental health courses for students at colleges and universities will facilitate the students' positive psychological construction in line with the attitude of tolerance and respect in overseas study and help

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them attain the coexistence of value and interest. This will encourage interactions between international students and Chinese residents and more communication between teachers and students, thereby benefiting China's social environment and helping them learn more about each other's habits; exchange programs such as "Perception of China" and "Insight into China" organized by Tsinghua University can be carried out to attract and encourage overseas students to visit China and study Chinese society and customs on the spot. Moreover, colleges may, according to the students' interests, arrange hobbies, organizations, community departments, and salons across years of study. A university regularly organizes multi-language exchange activities and administers an informal organization of information transmission channels to understand students' various needs and dynamics and to identify problems arising among international students and help them in time. When international students find the internal motivation for study and life, a higher adaptive ability will create a heightened sense of self-efficacy. Embracing Chinese culture with an optimistic, tolerant, and positive attitude will undoubtedly improve the efficiency of cultural integration.

# 6.2. Improve the Education and Training System to Improve the Study Adaptation Level of International Students

It is necessary to pay attention to the mesosystem environment and appearance environment of international students and to grasp the importance of the training system in the cultural integration of international students through study adaptation. In terms of teaching content and education quality that serve the national strategy of "double firstclass" construction, Peking University has made a path innovation for regular graduate programs—foreign aid and senior talent training strategy, particular English programs for international students, a cooperation mechanism between teachers and students at all levels and subjects, and the International Summer School and other special exchange activities. This innovation not only provides more opportunities and platforms for international students to practice cultural exchange but also enhances the university's enrollment and internationalization of education, promoting an accurate and comprehensive understanding among international students of the Chinese social environment and traditional culture. In terms of the entrance design, first, we should seek to improve the efficiency of Internet media in the entrance design of international students and the external communication of Chinese culture, and second, we should offer a wider range of scholarships and grants in regulating the quality of international students [60]. The establishment of scholarships is more oriented toward the ratio of investment and benefit. The quality of international students is effectively improved by constructing a high-standard enrollment evaluation system to promote the perception and adaptability of international students to unfamiliar environments.

Furthermore, colleges and universities should innovate management thinking modes and concepts [61]. A unique management organization for international students can be set up, relying on modern communication media technology. We can master the data of international students' learning performance and daily life, strengthen the global ability assessment of the whole faculty and staff, and establish the concept of "two-way convergence" to truly realize the cultural value of international students' education.

# 6.3. Strengthen International Exchanges and Cooperation to Help International Students Better Adapt to Culture

The government should strengthen economic and cultural cooperation through official and civilian communication platforms and high-frequency, high-quality interactions in advance so that potential students may participate in study groups to understand China's overall living conditions in the north and the differences in life, infrastructure, complete quality of life, and rhythm, which can shorten the potential psychological transition period, which for the international student is a long time. It can thus effectively solve the problem of culture shock. With the help of Chinese enterprises, the cultural connotations behind festivals can be conveyed concisely and efficiently by holding traditional festival parties and other entertainment programs [62]. Measures should also be taken to improve the

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quality and number of Confucius Institutes, to introduce excellent traditional culture to the countries along the Belt and Road based on a respect of cultural differences, and to improve the soft power and appeal of Chinese culture, so that students studying abroad can voluntarily pursue common values and quickly realize cultural integration [63].

To sum up, this paper identified existing problems in the cultural integration of international students in China and pointed out that the shortcomings of this integration mainly lie in the aspects of communication, life, management, and education. In order to coordinate the relationship between cultural integration and foreign students regarding the above four aspects and further deepen the cultural integration of foreign students through existing relationships between them, this paper constructs a new evaluation index system for the cultural integration of foreign students based on the ecosystem theory and posits corresponding hypotheses tested empirically. We found that life adaptation and interpersonal communication are the main factors affecting the cultural integration of international students, and the training system has an important impact on the cultural integration of international students through academic adaptation. On this basis, practical measures are advanced to effectively address problems arising in the cultural integration of international students and comprehensively improve the educational level of international students.

Theoretically, it is of great significance to study the mechanisms whereby life adaptation, interpersonal communication, the training system, and academic adaptation of international students in China influence their cultural integration so as to stabilize and improve China's international education level and status in the post-epidemic era. The evaluation index system of international students' cultural integration into the surrounding ecosystem developed in this study can enrich the theoretical model of international students' cultural integration. In practice, research in the COVID-19 pandemic should seek to improve the management of student teaching in colleges and universities to afford new perspectives to promote the spread of Chinese culture with deeper quality at the same time, and further enhance the internationalization of China's higher education management and teaching, thereby encouraging other countries to study the possibilities of transnational inter-regional cultural interaction. However, this study was mainly carried out in East China, and subsequent studies need to further expand the research scope and obtain research data from other countries or regions to further verify and improve the results and feasibility of this study.

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