sustainability

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Influence of Online Learning Environment and Student Engagement on International Students' Sustainable Chinese Learning

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Abstract: The outbreak of COVID-19 has forced Chinese international education to move online. An emerging number of studies have been published on online teaching and learning during the pandemic, few of which, however, focus on international students in China. This study examined the predictive effects of an online learning environment and student engagement on international students' learning of Chinese as a foreign language (CFL). Self-reported data were collected in an online questionnaire survey involving 447 international CFL students at eight universities located in different geographical regions in China. Descriptive statistics revealed the participants' favorable perceptions of an online learning environment, student engagement and Chinese learning achievement. The results of multiple linear regression revealed that three online learning environment factors, i.e., course accessibility, student interaction, course organization, and student engagement exerted significant positive effects on Chinese learning achievement. The implications of the study are discussed for the sustainable enhancement of the online learning environment to improve international students' online language learning.

Keywords: international students in China; online learning environment; student engagement; learning Chinese as a foreign language

Citation: Fan, J.; Tian, M. Influence of Online Learning Environment and Student Engagement on International Students' Sustainable Chinese Learning. *Sustainability* **2022**, *14*, 11106. https://doi.org/10.3390/su141711106

Academic Editors: Antonio P. Gutierrez de Blume, Javier Cifuentes-Faura, Joseph Crawford and Jo-Anne Kelder

Received: 1 July 2022
Accepted: 1 September 2022
Published: 5 September 2022

1. Introduction

In 2018, Chinese higher education institutions received 492,185 international students, ranking the third among the world's top 10 destination countries [1]. In January 2020, responding to the sudden outbreak of COVID-19, the Ministry of Education of China (MoE) [2] released the "disrupted classes undisrupted learning" policy, requiring schools and higher education institutions [HEI] to use online platforms to carry out teaching. Until now, the majority of international students registering with Chinese HEIs were located outside of China, having to continue their education online. It has been noted that online teaching in COVID-19 often involves "unplanned", rather than well-designed, well-organized courses [3]. Research literature has reported technical, financial, and pedagogical barriers faced by teachers and students in the COVID-19-related emergency online education [4], which is defined as "a temporary shift of instructional delivery to an alternate [online] delivery mode due to crisis circumstances" [5]. For example, a cross-cultural study demonstrated the adverse effects of COVID-19 on college students' learning behavior, including increased disengagement with programs due to lack of physical contact in online learning [6]. A large-scale survey study including 3080 Spanish university students revealed reduced student engagement in online learning activities and low academic achievement during the home confinement caused by COVID-19 [7]. Despite the increasing number of empirical studies on emergency online teaching, only a few focused on international students in language courses in Chinese higher education [8,9]. Support for these students' positive online learning experiences requires the development of research-based understanding.

Empirical research has explored foreign language learners' online learning experiences. The findings revealed important features of their perceived online learning environment, such as accessibility to online materials [10], opportunities for online interaction [11], online course design and organization [12], and teacher facilitation [13,14], all of which positively support online language learning. A recent Special Issue of the *System* journal discussed the impacts of COVID-19 on foreign language teaching and learning [15]. In this Special Issue, Derakhshan et al. [16] reported on the boredom experienced by Iranian students in online English classes. In addition, Ruiz-Alonso-Bartol et al. [17] explored the stress levels of American students studying Spanish online, highlighting reduced social interaction and unsatisfactory learning outcomes in Zoom teaching, compared to traditional face-to-face language classes. These studies provided insights into the influences of an online learning environment on foreign language learning in the pandemic. However, to the author's best knowledge, few of the studies focused on international students' learning of Chinese as a foreign language (CFL) in China. Hence, it is imperative to investigate the features of online CFL learning environments, as perceived by international students in China, and the impacts of their perceived online environment on CFL learning achievements.

Another crucial indicator of effective online foreign language education is the successful engagement of language learners in online learning activities. An increasing number of studies reveal that engagement in online learning significantly predicts the improvement of students' proficiency in the target language [18–20]. A mixed-method study, which explored Korean undergraduates' experiences in online second language classes in the pandemic, revealed that student engagement in note-taking, recording, and searching for additional materials positively predicts learning satisfaction [21]. Despite the contribution of previous research, it remains largely unknown whether and how international students' engagement in online CFL learning predicts CFL learning achievement, making the topic deserving of research attention.

This article reports the findings of a survey study involving 455 international students in online CFL courses at eight universities located in different geographical regions in China. Exploring the impact of COVID-19 from international students' perspectives, this research helps to identify the strengths and weaknesses of CFL teaching during this critical period. It contributes to the international discussions on the sustainable development of online language and international education in the post-pandemic era. The specific research questions (RQs) are listed below:

RQ 1: What are the characteristics of the participants' perceived online CFL learning environment, engagement, and achievement in CFL learning, as measured by self-reported development in Chinese language skills?

RQ 2: Do the participants' demographic factors, such as gender, geographical origin, scholarship status, online learning experience prior to COVID-19, and type of institution, predict their CFL learning achievement, as measured by self-reported development in Chinese language skills?

RQ 3: Do the participants' perceived online CFL learning environment and engagement in CFL learning predict their CFL learning achievement, as measured by self-reported development in Chinese language skills?

2. Literature Review

2.1. Online Learning Environment

Online learning was defined by Chang and Fisher [22] as "a system and process that connects learners with distributed and online learning materials", characterized by the spatial-temporal separation of teacher, students, and learning resources [22]. Studies investigated how learners' demographic variables are associated with online learning outcomes. The results revealed that gender [23,24], scholarship status [25], type of institution [26], and previous online learning experience [27] predict online language learning achievement, while geographical location [28] does not affect online learning.

With the development of web-based technology, a large volume of research has explored student perceptions of the environment where online learning takes place [22,29,30]. This research reports that accessibility to virtual learning materials and online course flexibility [22,29], students' interaction [22,30], teaching preparation and assistance activities [29,30], and online course design and organization [22,30] positively influence online learning [31–33]. Studies focusing on online foreign language learning investigated course design [12], teachers' pedagogy [13,14], learner interaction [11,34,35], and the development of foreign language skills [13,36,37]. These studies illustrated that well designed, prepared, and organized, online teaching can effectively support foreign language learning through the utilization of tools and technology. For example, Dahlberg and Bagga-Gupta [10] reported that through digital tools, online learning provides individuals a virtual learning environment with opportunities to access foreign language learning materials across time and space and this flexibility is appreciated by learners. Hsieh [11] reported that online resources enhance student interaction, which in turn helps to accomplish online collaborative English writing tasks. Sun and Shi [38] pointed out that friendly teacher–student relationships benefit online foreign language learning, and that teachers' guidance and assistance support students' accomplishment of language learning tasks. Moreover, Rienties et al. [12] indicated the importance of appropriate course design in online foreign language learning. Other research demonstrated that using wikis, blogs and forums in online courses enhances students' English as Foreign Language (EFL) writing performance, thus suggesting the integration of social communication media in organizing online EFL learning activities [13,37].

The COVID-19 pandemic brought about challenges and difficulties to international students. Studies reported that international students are likely to suffer from psychological and emotional problems, which in turn negatively affect their learning [39–41]. In addition, an increasing number of studies have investigated the challenges of emergency online foreign language classes in the pandemic [42–49]. For example, research has reported on foreign language learners' anxiety [42], insufficient social presence and inappropriate communication channels and settings [43], lack of peer interaction [44], and reduced teaching quality [45]. Given the challenges, Gonzalez-Lloret [46] suggested that technology-mediated collaborative learning tasks promote student–student interaction and enhance their productive language learning output. Similarly, Sun and Zhang [47] stressed the importance of the use of online peer feedback to support EFL writing. In addition, Chen [8] argued for the significance of accessibility to scaffolding materials, which would promote learner autonomy and facilitate online CFL learning in the pandemic. Acknowledging the challenges in emergency online language education, Gacs et al. [45] proposed a series of measures for language teachers and course administrators to prepare, design, implement, and evaluate online education in the crisis, including assessing the syllabus based on need analysis, planning the course format, delivery platforms, organization structure, communication types, course assessment and evaluation, modifying and adjusting the original plans, providing teacher training, and creating a collaborative online learning community. Despite their contribution to our understanding, the research on international students' online CFL learning remains limited in the context of the crisis. An investigation into the influences of multiple dimensions of an online environment on CFL learning achievement is important to support the sustainable development of online CFL education for international students in the post-pandemic era.

To address the aforementioned research gaps, the current research explores the impact of international students' perceived online CFL learning environment on their online CFL learning achievement during the COVID-19 pandemic. Since few studies discuss individual differences in online CFL learning, this research also investigated whether the participants' demographic factors predicted their online CFL learning achievement. The following research hypotheses were proposed:

Hypotheses 1a (H1a). *Gender has a significant impact on online CFL learning achievement.*

Hypotheses 1b (H1b). *University type has a significant impact on online CFL learning achievement.*

Hypotheses 1c (H1c). *Scholarship status has a significant impact on online CFL learning achievement.*

Hypotheses 1d (H1d). *Previous online learning experience has a significant impact on online CFL learning achievement.*

Hypotheses 1e (H1e). *Geographical location has no significant impact on online CFL learning achievement.*

Hypotheses 2a (H2a). *Accessibility to online learning materials (ACC) has a significant positive impact on online CFL learning achievement.*

Hypotheses 2b (H2b). *Student interaction (SI) has a significant positive impact on online CFL learning achievement.*

Hypotheses 2c (H2c). *Teacher support (TS) has a significant positive impact on online CFL learning achievement.*

Hypotheses 2d (H2d). *Course organization (CO) has a significant positive impact on online CFL learning achievement.*

2.2. Student Engagement

Kuh [50] defines student engagement as "the time and energy students devote to educationally purposeful activities". Empirical research has revealed student engagement as a critical factor influencing learning achievement in traditional face-to-face learning [51–53]. Studies focusing on online foreign language learning emphasized the enhancement of student engagement through computer-based and web-based means. Researchers also reported the positive relationship between student engagement and learning achievement [12,18–20]. For example, Rientis et al. [12] revealed that a Moodle-based virtual learning environment could promote student engagement, which in turn could contribute to students' success in foreign language learning. Rosell-Aguilar [19] found that learner engagement augmented through the use of a mobile application results in vocabulary improvement. Yang [20] reported that student engagement enhanced by teacher–student interaction through an online situated language learning system supports students' EFL learning.

Since the outbreak of COVID-19, studies have investigated learners' engagement in foreign language learning in emergency online courses [49,54–56]. Sadoughi and Hajazi [54] reported that teacher support significantly positively influences EFL students' engagement, which in turn supports effective online learning. Similar findings were also reported by Luan et al. [49] who highlighted peer support as an additional factor influencing student engagement. In contrast, Han et al. [55] found that teacher support exerts no significant influence on Chinese students' behavioral engagement, but negatively affected their emotional engagement in online EFL learning in the pandemic. Moreover, Mihai et al. [56] pointed out that online classroom environment dynamics, represented by positive peer relationships and consistent teacher–student interactions, are factors significantly supporting EFL learners' engagement and learning outcomes during the pandemic. The above studies highlight that student engagement is significantly associated with effective online language learning in the pandemic; however, none of these studies explored how engagement influences online CFL learning. Regarding international students in China, the pre-pandemic research revealed key aspects of the classroom environment, i.e., peer cooperation, peer competition, teacher support, and stimulating pedagogy, significantly positively relating to these students' engagement in learning [57–60]. Yet, to the best of our knowledge, the characteristics of international students' engagement in online CFL learning, and whether and how the engagement influences CFL learning achievement have not been discussed, and hence, deserve empirical investigation.

To address the aforementioned research gaps, the current research explored the characteristics of international student engagement in online CFL learning and their impact

on online CFL learning achievement in the COVID-19 pandemic. The following research hypothesis was proposed:

Hypotheses 3 (H3). *Student engagement has a significant positive impact on online CFL learning achievement.*

3. Methodology

3.1. Participants and Procedure

This survey invited participation from international students at eight universities in East, Northeast and central China, of which four are research-oriented and another four are teaching-oriented. International students at the participating universities have been taking classes online since the outbreak of the pandemic. In October 2021, the research team contacted international offices or international schools at the eight participating Chinese universities and obtained research permission. With the help of the international offices or international schools, an electronic version of the questionnaire in both English and Chinese was sent via WeChat, a social software widely used in mainland China, to international students taking full-time online Chinese courses at these universities. The questionnaire began with an introduction to this research, fully explaining the research purposes and the voluntary and anonymous principles the research followed. The students were then asked to complete an informed consent form before moving on to the questions. The data collection lasted for a month, from 29 October to 30 November 2021, ending with 455 responses.

As presented in Table 1, of the 447 international students participating in this survey study, 54.6% (n = 244) of the participants were male, and 45.4% (n = 203) were female. Most of them (67.1%, n = 300) enrolled in teaching-oriented universities, and 32.9% (n = 147) enrolled in research-oriented universities. Among all participants, 19.7% (n = 88) obtained scholarships, 72.3% (n = 323) received family financial support, and 8.0% (n = 36) paid tuition fees via other sources. In addition, 25.3% of the participants (n = 113) reported some online learning experience prior to COVID-19, and 74.7% (n = 334) had no prior online learning experience. Among these students, 57.7% (n = 258) were from Asia, 32.4% (n = 145) were from Africa, and only 9.9% (n = 44) were from other continents.

Table 1. Participants' demographic information.

Categories		Frequency	%
Gender	male	244	54.6%
	female	203	45.4%
Educational level	undergraduate	134	30.0%
	postgraduate	281	62.9%
	non-degree, short-term language training programs	32	7.1%
Continent of origin	Asia	258	57.7%
	Africa	145	32.4%
	other	44	9.9%
Tuition fee supported by	family	323	72.3%
	scholarship	88	19.7%
	other	36	8.0%
Online learning experience prior to COVID-19	yes	113	25.3%
	no	334	74.7%
Types of online Chinese courses	synchronous	120	26.8%
	asynchronous	100	22.4%
	both	227	50.8%
University type	research-oriented	147	32.9%
	teaching-oriented	300	67.1%

3.2. Measurement Instruments

The survey questionnaire consisted of two sections. The first section collected the participants' demographic information. The second section investigated the participants' online Chinese learning experiences with regard to the perceived online learning environment (online learning environment = OLE), self-reported engagement (student engagement = SE), and online learning achievement measured by self-reported development in Chinese language skills (online learning achievement = OLA). The OLE scale was adapted from the Web-based Learning Environment Instrument (WEBLEI, [22]) and the University Mathematics Classroom Environment Questionnaire (UMCEQ, [61]). As a widely adopted instrument to measure online learning environments in higher education [62–65], WEBLEI consists of four sub-scales, i.e., access, interaction, results, and response, assessing, respectively, the access to virtual subjects, online interaction, lesson structure and course organization, and students' evaluation of online learning impact. Developed by Chinese scholars, UMCEQ consists of the dimensions of teacher support, student autonomy, cooperation among students, competition among students, and learning satisfaction. Compared to the instruments designed in Western contexts, UMCEQ has been proved valid, reliable and effective in assessing Chinese college classroom dynamics [61]. Although UMCEQ was initially designed to focus on domestic Chinese students' math learning, the validity and reliability of its modified version have been confirmed in empirical research on international students studying science, engineering, and language disciplines in Chinese HEIs [59]. In the current research, three WEBLEI sub-scales, i.e., access, interaction, results, and one UMCEQ sub-scale, i.e., teacher support, were adopted and adapted to explore international students' perceived accessibility to online learning materials (accessibility = ACC, 7 items), opportunities for online interaction (student interaction = SI, 3 items), online course organization and management (course organization and management = CO, 8 items), and teacher support and pedagogy in online courses (teacher support and pedagogy = TS, 6 items).

The scales developed by Dowson and McInerney [66] and Skinner et al. [67] were adopted and adapted to explore student engagement in online Chinese learning (nine items). Five items were used to assess international students' CFL learning achievement, which was measured by the self-reported development of speaking, writing, listening, reading and overall communicative CFL skills.

All items were rated on a five-point Likert-type scale (1 = strongly disagree, 5 = strongly agree). Expressions of the original items were modified to fit the purposes of the current study. For example, "*The scope or learning objectives are clearly stated in each lesson*" was modified to "*The scope or learning objectives are clearly stated in each Chinese online lesson*", and "*I try hard to do well in school*" was changed to "*I try hard to do well in my online Chinese lessons*".

3.3. Data Analysis

The data analyses were conducted using SPSS 25 (IBM Corp., Armonk, NY, USA) and AMOS 23 (IBM Corp., Armonk, NY, USA). Respondents answered all required questions and no missing data were involved in the study. Skewness and Kurtosis values ranged from −0.595 to + 1.226, falling within the reference of −2 to +2, which suggested no substantial departure from normality [68]. Mahalanobis distances were calculated to detect multivariate outliers [69]. The results showed eight cases below the critical chi-square value with a stringent α level of 0.001. After the removal of the eight cases, 447 valid samples were obtained for further analysis.

Descriptive statistics, reliability and validity of the instruments, and correlations of variables were calculated using SPSS 25. A confirmatory factor analysis (CFA) was performed using AMOS 23 to test the construct validity of the scales. The representative indices, including the Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), and Non-Normed Fit Index (NNFI), were adopted to examine the goodness of fit for CFA. A standard multiple linear regression analysis was conducted using SPSS 25 to test the predictive power of OLE and SE on international students' OLA. The enter method was used in the regression analysis to explore and compare the predictive powers

of demographic factors, OLE factors, and SE on international students' OLA. This method facilitates the consideration of independent variables in one regression model, so as to compare the impacts of the independent variables on dependent variables [70].

4. Results

4.1. Construct Validity

The Kaiser–Meyer–Olkin (KMO) test and Bartlett's test of sphericity were first performed. The results (KMO = 0.967) and Bartlett's test of sphericity (Approx. Chi-Square = 12,678.684, df = 435, $p < 0.000$) confirmed the appropriateness of the instruments for the factor analysis. Table 2 presents the factor loadings of all items, which ranged between 0.708 and 0.883, i.e., higher than the benchmark value of 0.5 [71], indicating the validity of the items to explain the factors.

Table 2. Factor loading of items.

Factor	Item	Mean	SD	Factor Loading
ACC	ACC3	3.680	1.126	0.728
	ACC4	3.680	1.114	0.805
	ACC5	3.660	1.079	0.787
	ACC6	3.680	1.123	0.740
	ACC7	3.750	1.051	0.843
SI	SI1	3.630	1.115	0.833
	SI2	3.590	1.037	0.883
	SI3	3.800	0.934	0.825
TS	TS1	4.220	0.884	0.875
	TS2	4.220	0.893	0.849
	TS3	4.080	0.950	0.858
	TS4	4.220	0.893	0.882
	TS5	4.040	0.967	0.821
	TS6	4.130	0.885	0.827
CO	CO1	4.050	0.918	0.878
	CO2	3.960	0.949	0.869
	CO3	3.890	0.957	0.839
	CO4	3.990	0.873	0.853
	CO5	4.010	0.917	.841
	CO7	3.960	0.956	0.850
	CO8	3.970	0.944	0.831
SE	SE1	4.120	0.880	0.708
	SE2	4.010	0.935	0.761
	SE3	3.990	0.929	0.800
	SE4	4.000	0.962	0.777
	SE5	3.840	1.030	0.816
	SE6	3.880	1.009	0.769
	SE7	3.880	1.029	0.747
	SE8	3.990	0.905	0.835
	SE9	3.930	0.912	0.846
OLA	OLA1	3.640	1.060	0.813
	OLA2	3.770	1.024	0.847
	OLA3	3.780	0.995	0.863
	OLA4	3.650	1.106	0.806
	OLA5	3.560	1.076	0.855

Note: ACC = accessibility, SI = student interaction, TS = teacher support, CO = course organization, SE = student engagement, OLA = online learning achievement.

A CFA analysis was conducted to test the construct validity of the measurement instrument. The CFA results demonstrated the satisfactory goodness of fit indices of the OLE scale (χ^2 = 600.986, df = 182, p = 0.000, RMSEA = 0.072, CFI = 0.951, NNFI = 0.944), and the acceptable goodness of fit indices of the SE scale (χ^2 = 64.489, df = 21, p = 0.000, RMSEA = 0.068, CFI = 0.987, NNFI = 0.977).

4.2. Reliability, Correlations, and Descriptive Statistics

Table 3 presents Cronbach's α values of each variable. As shown in Table 3, Cronbach's α coefficients ranged from 0.879 to 0.948, indicating the good internal reliability of the instruments [72]. Table 3 also presents the correlation matrix of the OLE factors, SE and OLA. The analysis showed that the OLE factors were significantly positively correlated with OLA with a moderate strength (0.70 > r > 0.50; [51]), the OLE factors were significantly positively correlated with SE with moderate to strong strengths (ACC and SI, 0.70 > r > 0.50; TS and CO, r > 0.70; [73]), and SE was significantly positively correlated with OLA with moderate strength (0.70 > r > 0.50; [73]).

Table 3. Descriptive statistics, reliability and correlations.

	ACC	SI	TS	CO	SE	OLA
ACC	0.893					
SI	0.644 ***	0.879				
TS	0.596 ***	0.657 ***	0.940			
CO	0.690 ***	0.677 ***	0.842 ***	0.948		
SE	0.662 ***	0.659 ***	0.753 ***	0.819 ***	0.941	
OLA	0.590 ***	0.579 ***	0.540 ***	0.642 ***	0.660 ***	0.920
Mean	3.686	3.674	4.150	3.977	3.960	3.679
SD	0.920	0.925	0.800	0.813	0.787	0.917

Note: *** $p < 0.001$. Cronbach's α coefficient values are presented along the diagonal. ACC = accessibility, SI = student interaction, TS = teacher support, CO = course organization, SE = student engagement, OLA = online learning achievement.

Using SPSS 25, descriptive statistics were computed. As shown in Table 3, the mean scores of all variables were higher than the median score 3. The mean score of TS was the highest (=4.150), followed by the means of CO (=3.977) and SE (=3.960). The results demonstrated that international students tended to hold favorable perceptions of OLE, were likely to report satisfactory levels of SE in online CLF learning, and perceived that they had adequately developed Chinese language skills.

4.3. Multiple Regression Analysis

A multiple linear regression analysis was performed to explore the predictive power of OLE and SE on international students' OLA. The coefficient of determination R^2 indicates the model's prediction accuracy. In social science studies, the suggested classifications for R^2 values were weak (0.19), moderate (0.33), and substantial (0.67) [74]. The higher the R^2 value, the greater the explanatory power of the model. Three regression models were built to compare the predictive power of the three groups of factors on OLA. Model 1 examined the predictive power of demographic factors. Model 2 simultaneously examined the predictive power of demographic factors and OLE factors. Model 3 simultaneously examined the predictive power of demographic factors, OLE factors, and SE.

The results of the multiple regression analysis are presented in Table 4. As shown in Table 4, in Model 1 international students' previous online learning experience significantly predicated their OLA. In Model 2, previous online learning experience, accessibility to learning materials, student interaction, and course organization together accounted for 48.7% of the variance in OLA. The predictive power of the model was above a moderate level. In Model 3, previous online learning experience, accessibility to learning materials, student interaction, course organization and student engagement together accounted for 52.2% of the variance. The predictive power of the model was above a moderate level. Teacher support did not reach a significant level in Model 2 or Model 3. The R^2 change indicated that the three OLE factors (46.1%) were the strongest predictors of the variation of OLA; this was followed by SE (3.5%) and previous online learning experience (2.6%).

Table 4. Multiple regression analysis results.

Independent Variable	Dependent Variable: OLA								
	Model 1			Model 2			Model 3		
	B	SE B	β	B	SE B	β	B	SE B	β
(Constant)	3.493	0.188		0.539	0.215		0.258	0.214	
Gender	0.064	0.088	0.035	−0.009	0.065	−0.005	−0.034	0.063	−0.019
Research-oriented universities	−0.046	0.105	−0.024	0.064	0.078	0.033	0.061	0.075	0.032
Family-funded	0.115	0.120	0.056	0.058	0.089	0.028	0.113	0.086	0.055
Other funding resources	0.040	0.183	0.012	−0.134	0.134	−0.040	−0.074	0.130	−0.022
Previous experience	0.271	0.101	0.129 **	0.189	0.075	0.090 *	0.212	0.073	0.101 **
Asia	0.078	0.158	0.042	−0.006	0.116	−0.003	0.018	0.112	0.010
Africa	−0.085	0.166	−0.043	−0.092	0.121	−0.047	−0.051	0.118	−0.026
ACC				0.190	0.052	0.191 ***	0.136	0.051	0.136 **
SI				0.191	0.051	0.193 ***	0.152	0.050	0.153 **
TS				−0.061	0.076	−0.053	−0.122	0.075	−0.107
CO				0.485	0.083	0.430 ***	0.285	0.088	0.253 ***
SE							0.406	0.073	0.349 ***
F		1.690			37.543 ***			39.420 ***	
R^2		0.026			0.487			0.522	
ΔR^2		0.026			0.461			0.035	

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. ACC = accessibility, SI = student interaction, TS = teacher support, CO = course organization, SE = student engagement, OLA = online learning achievement.

Table 5 summarizes the results of hypothesis testing. In this study, six hypotheses were supported and four were rejected.

Table 5. Results of hypotheses testing.

	Hypothesis	Results
H1	H1a: Gender of international students has a significant impact on CFL OLA.	Rejected
	H1b: University type has a significant impact on CFL OLA.	Rejected
	H1c: Scholarship status has a significant impact on CFL OLA.	Rejected
	H1d: Previous online learning experience has a significant impact on CFL OLA.	Supported
	H1e: Geographical location has no significant impact on CFL OLA.	Supported
H2	H2a: ACC has a significant positive impact on CFL OLA.	Supported
	H2b: SI has a significant positive impact on CFL OLA.	Supported
	H2c: TS has a significant positive impact on CFL OLA.	Rejected
	H2d: CO has a significant positive impact on CFL OLA.	Supported
H3	SE has a significant positive impact on CFL OLA.	Supported

Note: ACC = accessibility, SI = student interaction, TS = teacher support, CO = course organization, SE = student engagement, OLA = online learning achievement.

5. Discussion

5.1. RQ 1: Characteristics of International Students' Online Chinese Learning Environment, Engagement and Learning Achievement

This study explored international students' online CFL learning experiences in the COVID-19 pandemic. The first research question examined the characteristics of international students' perceived online CFL learning environment, engagement, and achievement in CFL learning which was measured by self-reported development in Chinese language skills. The descriptive statistics revealed medium-to-high levels of international students' perceived online CFL learning environment, engagement and Chinese language skill development. The results reflected the participants' positive perceptions toward their emergency online CFL learning experiences. Specifically, the participants tended to agree that online

Chinese courses were well organized, providing adequate accessibility to rich online learning materials, and sufficient opportunities to interact with peers and faculty. Particularly, the participants tended to strongly agree that teachers were considerate, understood their online learning difficulties well, and provided crucial academic and social support. In addition, the participants were likely to report that they actively engaged in online Chinese learning and achieved desirable progress in Chinese listening, speaking, reading, writing and overall communicative CFL skills.

Previous research on international students in degree courses reported negative influences of online environments on academic studies during the pandemic [39–41]. This research focused on the participants in online language courses designed specifically for international students to gain accuracy in pronunciation and fluency of speaking, understand spoken Chinese, and consolidate grammar. The skill-oriented Chinese courses were less likely to involve the complex mental processes of calculating, synthesizing, reasoning or analyzing than degree courses. The nature of the courses and the language teachers' dedication may explain the participants' favorable perceptions of their online learning experience.

5.2. RQ 2: Demographics Predicting Online Chinese Learning Achievement

The second research question examined whether international students' demographics, such as gender, geographical origin, scholarship status, online learning experience prior to COVID-19, and institutional types, predicted their CFL learning achievement, which was measured by self-reported development in Chinese language skills. The results were different from those of the research reporting the significant impacts of gender [23,24], scholarship status [25], or university type [26], but consistent with the research stressing the significant influence of prior online experience [27] and reporting the insignificant influence of geographical origin [28] on online learning in the pandemic.

The findings seemed to suggest that the quality of skill-oriented language courses provided by research-centered and teaching-centered universities showed no significant differences. In addition, during the pandemic, for international students staying in their home countries, the financial support provided by host universities was often temporarily suspended, which may explain the lack of a significant impact of students' scholarship status on their CFL learning achievement. Moreover, our finding showed that international students' geographical origin had no significant effects on CFL learning achievement, confirming the observation that online learning weakened geographical boundaries, although it may strengthen the boundaries based on academic expertise [28]. With regard to prior online learning experience, the finding of this research was in line with those of the previous studies [27], stressing that students with more extensive internet-based learning experience could better organize their learning, and were likely to learn more effectively.

5.3. RQ 3: Influences of Online Environment on Online Chinese Learning Achievement

The third research question explored the possible influences of international students' perceived online CLF learning environment on their CFL learning achievement, which was measured by self-reported Chinese language skills development. The correlation analysis showed that the online Chinese learning environment significantly correlated with international students' CFL learning achievement. The regression analysis indicated that among the four online environmental factors, ACC, SI and CO significantly positively predicted CFL learning achievement. Specifically, it was found that CO significantly impacted international students' Chinese learning achievement. The result was consistent with previous studies [12,13,37], showing that the well-organized, clearly structured online Chinese courses, which provided sufficient technical support and utilized web-based resources, could facilitate international students' Chinese learning. Moreover, the regression analysis showed that SI positively predicted CFL learning achievement. The result contributed to the research literature on the importance of peer interaction in fostering second language development across various face-to-face educational contexts [11]. It is worth noting that

the physical distance in online learning may result in feeling isolated, particularly among international students who have to cope simultaneously with academic, linguistic and intercultural difficulties [42]. Social interaction could help to reduce learning anxiety and stress, form a sense of belongingness, and hence, promote international students' learning achievement [31]. In addition, in line with previous studies [10,30], this research showed that ACC significantly predicted CFL learning achievement. Accessibility to online teaching, synchronously and asynchronously, allowed international students to continue their education in the pandemic. Accessing rich online learning materials, moreover, supported self-study and enabled the acquisition of the target language.

In contrast, the research showed that although the participants highly appreciated the support they received from their teachers, TS had no significant impact on their online Chinese achievement. In other words, on the one hand, the participants perceived their language teachers as considerate and supportive; on the other hand, the consideration and support they perceived from their teachers did not significantly affect their Chinese learning outcomes. The result pointed to the possible dilemma of care and control faced by teachers in the pandemic. The caring teachers may have failed to exert control over online class disciplines or establish a proper online learning atmosphere to the extent that effective learning could occur. It is also possible that in the pandemic crisis, teachers may have attached more importance to safety and health issues, while lowering their expectations of international students' academic performance.

5.4. RQ 3: Influences of Engagement on Online Chinese Learning Achievement

The third research question also examined the influence of international students' self-reported engagement on their CFL learning achievement, which was measured by self-reported progress in Chinese language skills. The correlation analysis showed a significant positive correlation between international students' engagement and online Chinese learning achievement. The regression analysis showed that SE significantly positively predicted the CFL learning achievement. This finding was consistent with those of Rientis et al. [12], Rosell-Aguilar [19] and Yang [20]. The results showed that active engagement in online learning supported the CFL acquisition, while the lack of engagement in online Chinese learning activities negatively affected CFL learning outcomes.

6. Conclusions

This study investigated the characteristics of international students' perceived online learning environment and student engagement, and the influences of the perceived online learning environment and student engagement on their Chinese learning achievement in the pandemic. Data were generated by a survey involving 455 international students in emergency online Chinese courses in October 2021. The correlation analysis revealed significant correlations between OLE, SE and OLA. The regression analysis results indicated the significant impact of OLE and SE on OLA.

Based on the results, the following suggestions are proposed. Firstly, to support international students' online Chinese learning, host institutions should ensure accessibility to synchronous online teaching, asynchronous recorded lectures, and rich learning materials. Secondly, online Chinese courses should be well designed to ensure the appropriateness of teaching content. Innovative teaching strategies and assessment methods should be adopted to suit online language learning environment better. Thirdly, it is suggested that CFL learning activities should be carefully designed. Social media could be adopted to support positive peer interaction. Moreover, teachers should establish a caring relationship with international students while carefully managing the online learning atmosphere to ensure active engagement and support the acquisition of the target language.

This study has the following limitations. The first limitation lies in the self-reported progress in Chinese skills. Although the validity of self-reported data has been well supported [75,76], such data may not reflect the actuality of learning and teaching. Future research could adopt standardized test scores and investigate the factors associated with the

changes in the scores. Secondly, this research adopted the scales developed for assessing student engagement in activities for general educational purposes. When conducting research for this study, we noticed recent literature reporting the development of a scale that measures student engagement in Chinese foreign language classrooms [18]. We recommend future research adopt similar engagement scales and examine international student engagement as a multi-dimensional construct in the context of online CFL courses. Thirdly, the findings of this research revealed no significant impact of gender on Chinese learning. Future research could combine quantitative and qualitative designs to further investigate gender influences on online learning. Finally, as interaction effects may exist between OLE, SE, and OLA, future research should explore the interrelationships among the predictors in modeling CFL learning achievement.

Author Contributions: J.F. and M.T. contributed equally to the research and writing of this article. All authors have read and agreed to the published version of the manuscript.

Funding: This research was partially funded by Shaanxi Province Undergraduate and Further Education Teaching Reform Research Project (21ZZ003), Higher Education Academy of China "Higher Education Opening Up" Research Project (21ZSYZZD02), and Shaanxi Social Science Research Fund (2018Q03).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Informed consent was obtained from all participants involved in the study.

Data Availability Statement: Data are available on reasonable request. The data are not publicly available due to privacy and ethical restrictions.

Conflicts of Interest: The authors declare no conflict of interest.

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