Modelling the Relationship Between Chinese University Students' Authentic Language Learning and Their English Self-efficacy During the COVID-19 Pandemic

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Abstract The COVID-19 pandemic demanded pedagogical transformation that could engage Chinese English learners in a technology-mediated authentic language learning environment, which in turn challenged learners to develop both self-directed and collaborative learning skills in order to achieve meaningful learning. To understand students' meaningful online English learning, this study surveyed 529 Chinese university students on their perceptions of authentic language learning (AULL), self-directed learning (SDL), collaborative learning (CL), and their English self-efficacy (ESE) during the online learning period of the COVID-19 pandemic. The validation findings indicated that the survey possessed satisfactory validity and internal consistency. Survey results revealed Chinese university students' meaningful language learning with technology in an online English course during the COVID-19 pandemic. Structural equation modelling (SEM) unveiled

the interconnected relationships among AULL, SDL, CL, and students' ESE. More importantly, the mediating effects of SDL and CL offered a deeper understanding of language learners' meaningful online learning process. Results can inform educators about the importance of structuring authentic language learning with SDL and CL for both online and face-to-face learning beyond the pandemic.

Keywords Authentic language learning · Self-directed learning · Collaborative learning · English self-efficacy · Structural equation modelling (SEM)

Introduction

The spring semester for Chinese schools normally starts at the beginning of March after a one-month winter holiday. However, the COVID-19 pandemic in the spring of 2020 caused nationwide school closures and class suspensions. To minimize the impact of the pandemic on education, the Chinese Ministry of Education initiated the policy of “Suspending Classes Without Stopping Learning” (Zhang, Wang, Yang, & Wang, 2020), and issued the “Guidance on the Organization and Management of Online Teaching in Higher Education Institutions”¹ in February. The guidance instructed all universities to formulate and prepare online teaching plans based on the curriculum and network environment (Huang et al., 2020). Although transforming

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Chinese:

the courses into online forms at short notice posed great challenges, it was also an opportunity for educational practitioners and researchers to innovate courses with the support of information and communication technology (ICT) to enhance students' meaningful learning in an online environment. Using technology to engage learners in meaningful tasks that encourage authentic, intentional, and collaborative learning is of great significance for twenty-first-century learning (Howland et al., 2012). *Twenty-first-century learning/skills* refers to the lifelong learning competences needed in the increasingly globalized economy (Voogt & Roblin, 2012), and it has been advocated by international organizations, such as the Organisation for Economic Co-operation and Development (OECD) (Ananiadou & Claro, 2009) and the Partnership for 21st Century Skills (2015). Integrating key *twenty-first-century skills*, such as collaboration, communication, and ICT literacy, into the core curriculum and enhancing students' meaningful learning with technology are also congruent with the recent promotion of twenty-first-century learning in China (Chai et al., 2020).

In the field of Computer-Assisted Language Learning (CALL), researchers highlighted the importance of promoting language learners' digital literacy and communication skills in the twenty-first century long ago (e.g. Chapelle, 2001; Warschauer, 2001). Although much research has shown the positive effect of technology-enhanced language teaching, language learners may still lack strategies for effective language learning and communication with technology in the ever-changing digital world (Shadiev & Yang, 2020). Moreover, considering the abrupt online learning circumstance during the COVID-19 emergency, we found it necessary to redesign our courses to meet the urgent needs for online teaching in the short run and the goals of promoting English as a foreign language (EFL) learners' twenty-first-century-oriented skills in the long run. Specifically, we redesigned an undergraduate English course in a Chinese university that could help foster students' authentic language learning (AULL), self-directed learning (SDL), and collaborative learning (CL) with technology.

Although related studies were carried out addressing EFL learners' twenty-first-century skills with technology (Black, 2009; González-Lloret & Ortega, 2014), there is a lack of instruments for assessing their meaningful language learning. To address this issue, we adapted survey instruments to evaluate students' perceptions of meaningful language learning practices in the online English course, and examined the relationships among their AULL, SDL, CL, and English self-efficacy. The underlying assumptions were that the instructional design would lead to students experiencing twenty-first-century learning, which in turn would foster their self-efficacy. The finding could inform

educators about the significance of technology-mediated authentic language learning for both online and face-to-face learning during and beyond the pandemic.

Literature Review

Authentic Language Learning (AULL)

Authentic learning is one of the characteristics of meaningful learning, which posits that knowledge and skills are better understood and acquired when they are situated in meaningful real-world tasks (Howland et al., 2012). This conception is rooted in the theory of Situated Learning (Brown et al., 1989) and has prompted the design of instructional frameworks for authentic learning environments with technology in various disciplines (see Herrington et al., 2014). Authentic learning is particularly in line with the objectives of technology-mediated Task-Based Language Teaching (TBLT) in second/foreign language education (Ziegler, 2016), which emphasizes engaging students in technology-enhanced language tasks that involve real-world meaning. The language tasks under the TBLT curriculum not only intend to provide learners with rich and authentic input but also allow learners to use the language and technology in productive and meaningful ways (González-Lloret & Ortega, 2014). Guided mainly by TBLT pedagogy, a wide array of technological tools, especially mobile devices, were used to create authentic environments for language learners (Shadiev et al., 2020). Mobile multimedia tools enable language learners to access and create various image, audio, or video materials with the target language in tasks that are meaningful, contextual, and situated. A large body of research has shown positive learning outcomes of authentic language learning (AULL), such as improved motivation, attitudes, and language proficiency (Shadiev et al., 2017). In a recent study, Marden and Herrington (2020) integrated the framework of TBLT with Situated Learning and implemented AULL tasks in an online learning community. They conducted interviews on students of Italian as a foreign language and found that AULL tasks had a positive impact on their motivation and meaningful learning skills, such as collaboration and problem solving.

With the dramatic increase in new technology and online learning resources, González-Lloret and Ortega (2014) stated that promoting students' literacy in using technology for language learning is also one major objective of technology-mediated TBLT. However, aside from the abovementioned learning outcomes, limited research has investigated how AULL tasks might contribute to EFL learners' meaningful learning with technology, and there is a lack of validated instruments for assessment. One

relevant instrument is the “21st Century Learning Survey” developed by Chai et al. (2015) for measuring students' authentic problem solving, meaningful use of ICT, self-directed learning, and collaborative learning. Using this validated instrument, Chai et al. (2020) revealed that Chinese high school students did not experience much meaningful use of ICT in classrooms, and the results from the structural equation models showed that high school students' perceptions of twenty-first-century learning were predictive of their academic self-efficacy.

Self-Directed Learning (SDL) and Collaborative Learning (CL)

Self-directed learning (SDL) and collaborative learning (CL) with technology are both lifelong learning skills advocated in twenty-first-century education (Van Laar et al., 2017). They can be viewed as two mutually supportive learning processes that learners engage in while performing a meaningful task (Howland et al., 2012; Lee et al., 2014). While SDL enables learners to take the initiative in knowledge construction and self-monitoring, CL expands learners' understanding through social negotiation and communication supported by technological tools. When language learners are engaged in meaning-driven and communication-oriented tasks, rather than in those for producing language forms, they are more likely to learn autonomously and work collaboratively with peers to achieve a meaningful goal (Thomas & Reinders, 2010). Kukulska-Hulme and Viberg (2018) observed that in language classrooms, mobile CL is often combined with SDL under the teacher's guidance, along with the task-based, situated, or communicative approach to motivate learners and meet their learning needs.

Existing literature has recognized the affordance of technology in facilitating SDL or CL in foreign language learning (Lai et al., 2016; Resta & Laferrière, 2007). Lee et al. (2017) showed that university EFL learners' SDL is positively related to the use of computer technology. Studies have also noted that technology-mediated SDL or CL could improve learners' performance and efficacy in language learning (Hromalik & Koszalka, 2018; Sung et al., 2017). However, there is limited research on the relationships among Chinese university EFL learners' AULL, SDL, and CL. There is also a lack of research that examines the simultaneous roles of SDL and CL in predicting language learning outcomes.

English Self-Efficacy (ESE)

Self-efficacy is not only a key factor predicting learners' academic performance (Bandura, 1997) but also an outcome variable due to the cyclical feature of self-regulation

(Zimmerman, 2005). Prior efforts and performance can affect self-efficacy in the subsequent self-regulation phase. Thus, a language learner with better performance and positive feedback from peers/teachers may feel more efficacious (Raoofi et al. 2012). In Chai et al.'s research (2015, 2020), students' self-efficacy of knowledge creation was formulated as the outcomes of twenty-first-century learning. As the current study was carried out during the pandemic, it was unfeasible to implement reliable large-scale assessment of learners' English skills in an online environment. Therefore, students' English self-efficacy was selected as an indicator of the outcomes of meaningful language learning.

To address the context of foreign language learning, Wang et al. (2014) developed and validated an instrument to measure Asian EFL learners' self-efficacy in listening, speaking, reading, and writing. They found that learners' self-regulated learning was significantly associated with their English self-efficacy (Kim et al., 2015). Besides, students' collaborative activities could also improve their English self-efficacy (Tai, 2016). But there has been insufficient research investigating how Chinese university EFL learners' AULL may be associated with their English self-efficacy through both SDL and CL in an online learning setting.

Based on the literature review, it was hypothesized that during the COVID-19 online learning period, Chinese university students' AULL, SDL, and CL constituted their meaningful online English learning (MOEL). Among them, AULL is likely to drive students to engage in more SDL and CL activities, which in turn could predict improvement in their English self-efficacy (ESE). In this study, we adapted two questionnaires from existing instruments to measure their MOEL and ESE, and modelled the relationships among the abovementioned constructs using structural equation modelling (SEM). A hypothesized model was proposed in Fig. 1, and four research questions were addressed:

- (1) Are the two adapted instruments measuring EFL learners' perceptions of MOEL and ESE valid and reliable?
- (2) How did Chinese university students perceive their MOEL during the COVID-19 pandemic?
- (3) To what extent does students' AULL predict their ESE?
- (4) To what extent do SDL and CL mediate the relationship between AULL and ESE?

Fig. 1 A hypothetical structural model for meaningful online English learning (MOEL)

Methods

Research setting

This study took place in an undergraduate English course at a comprehensive university in northern China. It is a compulsory course aimed at improving non-English majors' general English skills. It involves over 2,000 freshmen with 12 instructors with an average class size of 60 students. Before the pandemic, the course adopted a blended teaching mode with technology, such as multimedia, smartphone applications, and online learning platforms (Xu & Fan, 2017). However, classroom teaching was still largely teacher-centred in that the teacher talked most of the time and referred to the textbook to guide the curriculum, and classroom furniture was arranged in rows of desks facing a blackboard (Chen & Yu, 2019). Students had limited opportunities to speak in public within the 90-min session each week. During the pandemic, the course was redesigned in consultation with all the instructors. Before the start of the online teaching, all instructors received a series of training sessions on technology use, and detailed teaching procedures and materials were recommended to them. In the synchronous online class, the video-conferencing software, *Zoom*, or another similar software package, *Tencent Meeting*, was used. The instructor and students interacted through shared screen and text/voice chat. The ones who spoke had to turn on their cameras as the Internet connection could be overloaded if all participants had their cameras on simultaneously. To support authentic language learning, a collection of topic-related English videos, including movies, TV series, news reports, and documentaries, was provided to offer students a rich, immersive, and authentic input, and textbook-based instructional videos and exercises were moved before the class on *Blackboard* to foster students' self-directed learning. This change of teaching mode was

intended to leave more time for interactive and collaborative communications during the synchronous session. A series of tasks of real-world relevance were assigned to students each week, such as reading original articles, movie dubbing, writing a thank-you letter to classmates, and working out a plan for enhancing public security. Students were required to watch English videos, read texts in digital format, search for information online, create digital files through co-editing applications, and prepare for group presentations by working collaboratively online. During the synchronous class, students had opportunities to share their digital work and receive classmates' and instructor's feedback. The whole course was supported by technology and lasted for 16 weeks.

Participants

The participants were first-year undergraduate students taking the course. They generally had an intermediate English level equivalent to CEFR B1-B2. This study adopted convenience sampling and 711 potential participants from 20 English classes were invited to respond to an online survey at the end of the semester. Altogether 529 students completed the survey (a response rate of 74.40%). There were 74.30% male students, reflecting the overall gender ratio of the course. The participants' age ranged from 17 to 22 years (mean = 19, SD = 0.85). They completed the two Chinese-version questionnaires in the same session lasting approximately 10 min.

Instruments

Two questionnaires were adapted from existing validated instruments, and both were modified and translated into Chinese by two professors of Education and one experienced English instructor (see Appendix 1). All the items were measured with a 5-point Likert scale (from 1 *strongly disagree/I cannot do it at all* to 5 *strongly agree/I can do it well*). At the beginning of the survey, students were briefed that they should respond to the survey questions based on their learning experiences of the online English course in this semester. Besides the questionnaire items, two open-ended questions were included in the survey to offer a qualitative perspective on students' meaningful online English learning (MOEL). One question asked students to describe their overall learning experience of the online course during the COVID-19 pandemic, and the second asked how they utilized technology for authentic language learning throughout the course.

Meaningful Online English Learning Questionnaire (MOELQ)

The questionnaire consists of three dimensions with 17 items, including Authentic Language Learning (AULL), Self-Directed Learning (SDL), and Collaborative Learning (CL) with technology. They were adapted from Authentic Problem Solving, SDL, and CL (Cronbach's α ranging from 0.80 to 0.88) in a valid and reliable instrument developed by Chai et al. (2015) for measuring students' twenty-first-century learning. The adaptation was mainly about phrasing the items within the online English learning context using technology during the COVID-19 pandemic. For example, when measuring AULL, the original item, "I learn about real-life problems that people have" was modified to "I use technology to learn about problems happening in the real world (e.g. watching online English news on COVID-19)".

University Students' English Self-Efficacy Questionnaire (USESEQ)

The questionnaire USESEQ was used to measure Chinese university students' English self-efficacy. It consists of four dimensions with 20 items measuring university students' self-efficacy for English listening, speaking, reading, and writing based on the framework of the Questionnaire of English Self-Efficacy (QESE) (Cronbach's α ranging from 0.88 to 0.92) (Wang et al., 2014). To better target Chinese university students' self-efficacy, some items were modified with more specific descriptors of university-level English skills (Level 4–5) from China Standards of English Language Ability (Jin et al., 2017). For example, when measuring listening self-efficacy, the original item "Can you understand American TV programs"? was modified to "Can you understand *normal-speed* radio, film and TV programs on *general topics*"? The change was based on the consideration that linguistic difficulty and topic complexity should be taken into consideration, as measuring self-efficacy is asking whether one can execute the specific course of action to achieve successful performance (Bandura, 1997).

Data Analysis

The procedure of the quantitative data analysis is sequential exploratory factor analysis (EFA), confirmatory factor analysis (CFA), correlation analysis, and path analysis. First, a randomly selected 40% of cases ($N = 211$) were used for performing the EFA of MOELQ and USESEQ separately in IBM SPSS 23.0 to clarify the factors. The sample size of EFA met the subject to item ratio of 10:1 suggested by Costello and Osborne (2005). Altogether 29

items were retained from the two instruments after the EFA analysis. Then the structural equation modelling (SEM) technique was employed using AMOS 22.0 with the remaining 60% ($N = 318$) of observations to examine the measurement model (i.e. CFA for the construct validity) and the structural model (i.e. path analysis for relationships among constructs). Pearson's correlation analysis among all the MOELQ and USESEQ factors was also conducted. In order to decide the suitable sample size for the SEM analysis, we referred to the minimum sample size using the a priori sample size estimation method. With an anticipated effect size of 0.3, the desired statistical power level of 0.8, seven latent variables, 37 observed variables, and $p \leq 0.05$ (Westland, 2010), the recommended sample size is 170, so 318 participants in this study would suffice for the SEM analysis. The maximum likelihood (ML) method was chosen for estimation. The values of factor loadings, average variance explained (AVE), and composite reliability (CR) were estimated to evaluate the validity and reliability of the measurement model. As theorized by Wang et al. (2014), EFL students' English self-efficacy was perceived across learning tasks in listening, speaking, reading, and writing. To simplify the relationships among all the factors, the four dimensions of USESEQ were combined into a second-order construct representing overall English self-efficacy (ESE). Next, the path analysis was performed to test the relationships among AULL, SDL, CL, and ESE in the structural model. To test the mediation effects of SDL and CL, a bootstrap approach to obtaining confidence intervals (Preacher & Hayes, 2008) with a resample of 5,000 (95% percentile confidence level) was used and the interpretation of the results was guided by Zhao et al.'s (2010) typology of mediation.

We adopted the content analysis procedures (Popping, 2015) to analyse students' responses to the open-ended questions. First, we read through all students' responses to identify the themes related to the second research question, that is, students' perceptions of MOEL. Based on the reading, the coding scheme was established (see Table 1), which includes students' perceptions of AULL, SDL, and CL activities, perceptions of technology use, and attitudes toward the online English course. Two researchers of this study served as coders and coded the responses independently. All the inter-coder agreements were greater than 80%, indicating that the coding procedures were sufficiently reliable. When disagreements arose, the two coders each stated their reasons based on the coding scheme and reviewed the responses to reach a consensus.

Table 1 The coding scheme of students' perceptions of MOEL

Category	Description	Example
Authentic language learning (AULL)	Learners engaged in real-world activities in English, such as problem solving and communication, in a technology-mediated environment	<i>"I was asked to introduce the U.S. Marine Corps to the whole class online. I prepared a lot of materials. This was an unforgettable experience".</i>
Self-directed learning (SDL)	Learners intentionally used technology to guide, organize, and evaluate their language learning	<i>"I think the online learning is a test of one's self-discipline, so I insisted on completing my vocabulary learning each week on the learning app".</i>
Collaborative learning (CL)	Learners collaborated online with peers to complete a task or exchange ideas	<i>"I really enjoyed working with my group members online, especially the movie dubbing activity".</i> <i>"My classmate reminded me of the homework on QQ".</i>
Technology use	The adaptation and maladaptation of using technology for language learning	<i>"I got used to reading and annotating electronic books on my tablet".</i> <i>"Electronic textbooks are not as easy to use as paper textbooks".</i>
The online English course	The quality and efficiency of the online course	<i>"The interaction between the teacher and students is stronger. I like the learning atmosphere".</i> <i>"Online learning has greatly improved my English, and I can review the learning materials more conveniently".</i>

Results

Exploratory Factor Analysis of Questionnaires

The EFA was conducted with principal axis factoring to clarify the factors of the items in MOELQ and USESEQ. As the factors of social science research are usually correlated (Gorsuch, 1983), the oblique (oblimin) rotation method was adopted and multiple methods (e.g. scree plots) were combined to determine the number of factors to extract. Items with pattern coefficients lower than 0.40 or with multiple cross-loadings were excluded (Hair et al., 2010). Also, the Cronbach's α for each dimension of the instruments was calculated to ensure internal consistency.

EFA of MOELQ

The results of the EFA of MOELQ are shown in Appendix 2, including the factor pattern coefficients, structure coefficients, means, standard deviations (SD), and Cronbach's α values. The KMO value was 0.88 and the result of Bartlett's Test of Sphericity was significant ($\chi^2 = 1156.43$, $p < 0.001$), indicating that the samples were appropriate for factor analysis. The total variance explained was 53.52%. Thirteen items were retained and grouped into three factors: "AULL (5 items)", "SDL (3 items)", and "CL (5 items)". The reliability coefficients (Cronbach's α) for each factor ranged from 0.75 to 0.85, and the overall coefficient was 0.88. The factor loadings (pattern coefficients) of all items ranged from 0.55 to 0.80, indicating that the factors were reliable for assessing learners' AULL,

SDL, and CL. The mean score of AULL was 3.50 (SD = 0.76), showing that most students perceived a moderate level of engagement in authentic language learning activities during the pandemic. Their SDL and CL showed an average score of 3.82 (SD = 0.70) and 3.47 (SD = 0.76), respectively.

EFA of USESEQ

The results of the EFA of the USESEQ are shown in Appendix 3. The KMO value (0.90) and the result of Bartlett's test ($\chi^2 = 1836.19$, $p < 0.001$) suggested the suitability of conducting factor analysis. The total variance explained was 61.06%. The final USESEQ retained four factors with 16 items (each with 4 items): "Listening Self-Efficacy (LSE)", "Speaking Self-Efficacy (SSE)", "Reading Self-Efficacy (RSE)", and "Writing Self-Efficacy (WSE)". The Cronbach's α was 0.91 for all items, 0.87 for LSE, 0.85 for SSE, 0.84 for RSE, and 0.84 for WSE. The factor loadings (pattern coefficient) of all the items ranged from 0.51 to 0.90, indicating that these factors were sufficiently reliable for measuring university students' English self-efficacy.

Test of the Measurement Model

After the EFA, we performed confirmatory factor analysis (CFA) using SEM to test our measurement model. All the items and dimensions of MOELQ and USESEQ were included in a single model to examine the reliability and validity of both instruments. The results in Appendix 4

showed that all the items of MOELQ and USESEQ had significant factor loadings ranging from 0.61 to 0.85, indicating suitable factor loadings greater than 0.50 (Hair et al., 2010). The skew and kurtosis coefficients for all items were within the range of -2 to 2, suggesting that all items met the normality requirement (Kline, 2011). The composite reliability (CR) and the average variance extracted (AVE) were calculated. The CR values ranged from 0.68 to 0.89, which met the acceptable level of 0.60 (Fornell & Larcker, 1981). The AVE ranged between 0.41 and 0.68, with two values (AULL = 0.48, SDL = 0.41) below the recommended level of 0.50. According to Fornell and Larcker (1981), the AVE is a more conservative estimate, and on the basis of CR alone, “the researcher may conclude that the convergent validity of the construct is adequate” (p. 46). As the CR values of the two constructs were above 0.60 (AULL = 0.82, SDL = 0.68), the internal reliability of the measurement items was acceptable, although not rigorous. Therefore, the convergent and construct validity of the questionnaires were established.

The goodness of fit index (GFI) = 0.88 and adjusted goodness of fit index (AGFI) = 0.86 were not higher than 0.90 but still reached an acceptable value (Gefen et al., 2000). In addition, other model fit indices (χ^2/df) = 1.63, the incremental fit index (IFI) = 0.96, the Tucker–Lewis index (TLI) = 0.95, the comparative fit index (CFI) = 0.95, the root mean square error of approximation (RMSEA) = 0.045, and the standardized root mean square residual (SRMR) = 0.044 suggested a model that fit reasonably well (Hair et al., 2010). In MOELQ, the average scores of AULL, SDL, and CL were 3.61 (0.73), 3.88 (0.66), and 3.47 (0.80) (SD in brackets), while in USESEQ, the average scores for students' LSE, SSE, RSE, and WSE were 3.59 (0.70), 3.53 (0.68), 3.50 (0.75), and 3.66 (0.64) in sequence, respectively.

Correlation Analysis

In order to explore the relationships among the factors of the two questionnaires, Pearson's correlation analysis among all the MOELQ and USESEQ factors was conducted. As shown in Table 2, all factors were significantly correlated with each other ($p < 0.001$).

Test of the Hypothesized Structural Model

Based on the correlation results, we performed path analysis using SEM to test the hypothesized structural model as depicted in Fig. 1. The final structural model and path coefficients are displayed in Fig. 2. The fit indices of the structural model showed that the model had an acceptable fit (GFI = 0.88, AGFI = 0.85, χ^2/df = 1.72, IFI = 0.95, TLI = 0.94, CFI = 0.95, RMSEA = 0.048, SRMR = 0.053) (Hair et al., 2010). Based on the results of Fig. 2, the four dimensions of the USESEQ were successfully included in one second-order factor “ESE”. Most of the hypotheses proposed in this study were confirmed. AULL significantly predicted SDL (path coefficient = 0.74, $t = 8.01$, $p < 0.001$), CL (path coefficient = 0.53, $t = 7.80$, $p < 0.001$), and ESE (path coefficient = 0.51, $t = 4.80$, $p < 0.001$). Both SDL and CL were significantly associated with ESE, with path coefficients of 0.21 ($t = 2.13$, $p < 0.05$) and 0.20 ($t = 3.36$, $p < 0.001$), respectively.

Mediation Test

To check whether SDL and CL mediated the relationship between AULL and ESE, a bootstrapping method (Preacher & Hayes, 2008) with a resample of 5,000 (95% percentile confidence level) was performed. The results were determined according to Zhao et al.'s (2010) suggestions and are shown in Table 3. In the direct model

Table 2 The correlation among the MOELQ and USESEQ factors (N = 318)

Factors	1	2	3	4	5	6	7	8
1. Authentic Language Learning (AULL)	—							
2. Self-Directed Learning (SDL)	.54***	—						
3. Collaborative Learning (CL)	.43***	.45***	—					
4. Listening Self-Efficacy (LSE)	.58***	.43***	.41***	—				
5. Speaking Self-Efficacy (SSE)	.53***	.44***	.44***	.71***	—			
6. Reading Self-Efficacy (RSE)	.53**	.43***	.37***	.60***	.50***	—		
7. Writing Self-Efficacy (WSE)	.51***	.51***	.50***	.62***	.59***	.61***	—	
8. Overall English Self-Efficacy (ESE)	.64***	.54***	.51***	.87***	.83***	.82***	.83***	—

*** $p < 0.001$

Fig. 2 The structural relationships among AULL, SDL, CL, and ESE. Note. * $p < 0.05$, *** $p < 0.001$

without mediators, AULL was significantly directly associated with ESE (path estimate = 0.436, $p < 0.001$). In terms of the indirect model, statistical significance was not found in the path from AULL through SDL to ESE (estimate = 0.134, $p > 0.05$), whereas statistical significance was established in the relationship between AULL and ESE with CL as a mediator (estimate = 0.091, $p < 0.01$). Based on Zhao et al.'s (2010) typology, SDL had non-mediation and CL had a complementary mediation effect on the relationship between AULL and CL.

Qualitative Results

Students' answers to the open-ended questions offered a qualitative perspective for understanding their meaningful online English learning (MOEL) during the COVID-19 pandemic. The quoted words were extracted and translated into English by the authors. To begin with, students' responses revealed that the online learning during the pandemic made them adopt more technology-supported approaches in English learning. Students mentioned that they did not bring their textbooks home, as COVID-19 broke out during the winter holiday. They therefore relied mainly on digital textbooks and online resources using computers, smartphones, or tablets throughout the

semester, as narrated by one student: "At first, I missed the traditional printed textbooks, but I gradually got used to reading and annotating digital materials on my tablet". Most students acknowledged the affordance of technology during this special learning period. Meanwhile, they recognized the quality of the teaching materials on *Blackboard* and the video-conferencing software in supporting synchronous online classes. They considered that this form of learning "maximized the efficiency of the classroom".

In terms of authentic language learning (AULL), students reported that they had engaged in more AULL activities supported by technology in this semester. One student recalled that he had spent a whole night editing and perfecting their group's English video project and "got really excited about it", because the next day they were going to present it in front of the whole class. Those meaning-driven tasks were more engaging to students than simply "listening to the teacher talking throughout the class". These practices aroused their interest and expanded their knowledge of and skills in technology-mediated English learning, which in turn motivated them to engage in more AULL activities on their own. One student mentioned that he tried a teacher-recommended app called *Jiaoliudian* to practice spoken English with native speakers in a chatroom. He said, "I found that they didn't really care

Table 3 Mediation analysis results

Tested relationship	Direct model without mediator	Indirect model	95% CI	Results
AULL → SDL → ESE	.436***	.134	[-.008, .307]	Direct-only (Non-Mediation)
AULL → CL → ESE	.436***	.091**	[.034, .166]	Complementary (Mediation)

AULL authentic language learning, SDL self-directed learning, CL collaborative learning, ESE English self-efficacy

** $p < 0.01$; *** $p < 0.001$

about my accent, and this improved my confidence in speaking English". However, students also reported frustrations and difficulties in searching for useful materials on English websites when preparing for group presentations.

The themes regarding students' self-directed learning (SDL) and collaborative learning (CL) were also identified. In general, students felt that the online resources and various technological devices were sufficient in supporting their SDL and CL activities. Some reported that they could pause and replay online instructional videos at any time to better understand learning content, and they used various smartphone productivity apps to help them control screen time and organize learning plans. Meanwhile, they generally found it convenient to interact and collaborate with group members on *WeChat* or *QQ* to prepare for the group tasks, as *"this was how we stayed in touch with classmates at normal times"*. However, it posed higher demands on their self-regulatory competences. Without teacher's face-to-face monitoring, students who lacked SDL and CL were easily distracted and slacked off during the synchronous session. Some even played video games, while others were talking. One student said that he *"couldn't feel the learning atmosphere"* and *"it required very strong self-control"*. Most students, despite finding this form of teaching to be novel and efficient, expressed their longing for normal campus life and offline classrooms.

Discussion

This study surveyed Chinese university students' perceptions of authentic language learning (AULL), self-directed learning (SDL), collaborative learning (CL), and their English self-efficacy (ESE) after they attended an online English course during the COVID-19 pandemic. By employing SEM analysis and a mediation test, the relationships among students' AULL, SDL, CL, and ESE were examined.

Validation of the Instruments

This study validated two instruments for measuring Chinese university students' meaningful online English learning (MOELQ) and English self-efficacy (USESEQ). The results from EFA and CFA indicated that all the factors of MOELQ and USESEQ possessed satisfactory validity and were sufficiently reliable. During the pandemic, English online learning platforms and digital tools were growing at an unconventional rate. Yet simply having access to a wealth of digital resources does not guarantee effective learning unless learners are undertaking meaningful inquiry intentionally and collaboratively (Howland et al., 2012). It is important for educators to innovate

pedagogy to enhance learners' twenty-first-century skills in classrooms. With the two validated instruments, we were able to examine the effect of AULL tasks on students' meaningful language learning with technology and their English self-efficacy in the redesigned online English course during the COVID-19 pandemic.

Chinese University Students' MOEL

The qualitative findings from the open-ended questions showed that compared with normal times, students engaged in more technology-mediated meaningful language learning activities. Nonetheless, the average score of students' perceptions of MOEL indicated a moderate level of AULL, SDL, and CL during the COVID-19 pandemic. This finding is consistent with Chai et al.'s (2020) research on Chinese high school students, except that the university students showed a higher level of SDL in their meaningful language learning, implying that students on average exhibited more SDL, such as intentionally adjusting learning methods and tools to monitor and evaluate their learning process. The qualitative results were consistent with this finding. The moderate level of AULL and CL perceived by students may partly be due to the fact that the authentic tasks designed in the course were still based on topics from the textbook. Educators need to better link the tasks with students' personal experiences and interests to fully motivate their engagement in authentic language learning (Marden & Herrington, 2020).

The results of the correlation analysis showed the interconnected relationships among AULL, SDL, and CL, which confirmed the hypothesis that Chinese university students' AULL, SDL, and CL constituted their MOEL. This finding echoed Howland et al.'s (2012) statement that the characteristics of meaningful learning are interrelated, interactive, and interdependent. Besides, the results of the path analysis among AULL, SDL, and CL confirmed the hypothesis that engaging in real-world language tasks is likely to drive learners to learn intentionally and collaboratively to fulfil a meaningful goal. The qualitative results analysing students' online learning experiences further verified their MOEL process during the pandemic. Generally speaking, the reformed pedagogy and technological tools adopted in the online course allowed students to better explore the affordance of technology for language learning. Considering that there was still room for improvement in students' MOEL, more pedagogical guidance on authentic language learning, such as using the Internet efficiently to search for authentic materials or to interact with native English speakers properly, should be provided in future English classes. At the same time, more training programs or learning activities should be designed

to enhance students' self-directed and collaborative use of technology for language learning.

The Role of AULL in Predicting ESE

The significantly positive correlation among all the factors of MOELQ and USESEQ established the relationship between students' meaningful language learning and their efficacy in English listening, speaking, reading, and writing. Specifically, students' AULL was a significant predictor of their ESE. As previous studies have identified the facilitating role of technology and authentic tasks in foreign language improvement (Shadiev et al., 2020), both the quantitative and qualitative results further confirmed that learners' authentic language learning with technology could lead to improved confidence in language skills (Marden & Herrington, 2020). As Wu et al. (2011) noted, even a small amount of authentic online interaction could boost students' confidence in their language learning and allow them to communicate more comfortably in English. This finding showed the importance of structuring authentic language learning tasks with technology in English classrooms during and beyond the pandemic.

The Mediating Role of SDL and CL

The results of the mediation test indicated that despite the significantly positive correlation between AULL and SDL as well as between SDL and ESE, the mediating role of SDL was not established, whereas CL served as a complementary mediator in the relationship between AULL and ESE. The results implied that the learners' engagement in authentic language learning may give rise to their English self-efficacy through collaborative learning during the COVID-19 online course. This finding may reflect the special nature of students' online learning situation during the pandemic. The significance of collaboration via technology appeared to be more pronounced for students who were learning alone at home. It also corresponded with Herrington et al.'s (2014) view that authentic tasks are often complex and ill defined, thus requiring more collaborative effort, especially for students studying at a distance. The online collaborative tasks allowed students to share their ideas, seek help, and contribute to group work by using various technological tools. Meanwhile, given that both SDL and CL are important learning skills in the twenty-first century, more research should be conducted in the future to test their mediating roles in the relationship between AULL and ESE in blended/online learning environments beyond the pandemic.

Practical Implications

This study has important practical implications for online English courses during and beyond the COVID-19 pandemic. First, the redesigned instructional approach of the English course was found effective in supporting the online teaching and in promoting students' twenty-first-century learning. The technology-supported authentic language learning (AULL) activities facilitated students' self-directed learning and collaborative learning during the pandemic, and gave rise to their English self-efficacy (ESE). Second, during this special learning period, collaborative learning with technology played a significant role in mediating the relationship between AULL and ESE. Consequently, it is suggested that educators should structure more collaborative activities for students learning at a distance. Third, this study sheds light on the importance of meaningful English learning for both online and blended learning beyond the pandemic. With the growing emphasis on integrating students' twenty-first-century skills into the curriculum, the instruments validated in this study could be used during or at the completion of an English course to examine the quality of the instructional design in fostering twenty-first-century learning.

Conclusion

Learning to learn and learning to collaborate are two major twenty-first-century skills (Howland et al., 2012), and using technology to perform real-life activities in English (Shadiev et al., 2020) is also a critical skill for university students in this increasingly globalized world. This study validated two survey instruments and assessed Chinese university students' perceptions of meaningful language learning and English self-efficacy in an online English course during the COVID-19 pandemic. By employing structural equation modelling (SEM), this study identified the role of authentic language learning in predicting students' English self-efficacy. This study also contributes to existing literature by testing the mediating roles of both SDL and CL simultaneously in the relationship between authentic language learning and English self-efficacy. The redesigned instructional approach generally supported the online teaching in times of emergency and received overall positive feedback from students.

This study has several limitations. The first is related to the convenience sampling. The whole sample was collected in a northern Chinese university featuring engineering and science disciplines, where male students outnumbered females. Consequently, the findings may possess limited generalizability. Besides, data were only collected at the

end of the online course, which might not reflect the changes in students' meaningful online English learning. More longitudinal studies should be carried out in the future. Moreover, other research data, such as interviews and students' online learning records, could be combined with the survey data to fully depict university students' meaningful language learning process. In addition, we realized that the AVE values of AULL and SDL were not satisfactory. In order to further validate the instruments, we recommend a larger sample for analysis in future studies.

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