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Factors influencing Chinese undergraduate students' emotions in an online EFL learning context during the COVID pandemic

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Abstract

Background: Considerable evidence suggests that students' achievement emotions are important contributors to their learning and success online. It is, therefore, essential to understand and support students' emotional experiences to enhance online education, especially under the COVID-19 context. However, to date, very few studies have investigated how students' achievement emotions might be affected by teaching and learning factors in online learning environments.

Objectives: Based on Pekrun's (2006) control-value theory of achievement emotions, this study examined the influence of students' perceived online teaching quality and appraisals of control and value on their achievement emotions in an online second language (L2) learning context instigated by the COVID-19.

Methods: Data were collected using an online survey of 1503 undergraduates from ten universities across different regions of China. Confirmatory factor analyses (CFA) were performed to test the validity of the instruments and structural equation modelling were conducted to examine the relations between L2 teaching and learning variables.

Results and Conclusions: Results revealed that perceived teacher internet and communication technology competence had positive effects on enjoyment, but negative effects on anxiety and boredom, and these effects were fully mediated by perceived control and/or value. Perceived chaotic teaching structure (CTS) had reverse effects for the three emotions. Perceived CTS effects on enjoyment and anxiety were fully and partially mediated by perceived control, respectively.

Takeaways: Online teaching quality is critical for students' appraisals and emotions towards L2 learning. Teachers should strive to improve online teaching quality and design interventions targeting students' perceived control and value to temper their affective experiences associated with the crisis-prompted online teaching practices.

KEYWORDS

appraisals, COVID, emotions, foreign language learning, ICT competence, online teaching

1 | INTRODUCTION

Due to the COVID pandemic, schools and universities were closed on a nationwide or local basis in 161 countries, affecting approximately 1.725 billion learners worldwide (UNESCO, 2020). In response to school closures, China became one of the first countries to implement nationwide online learning programs and utilize various educational applications and platforms (e.g., massive open online courses (MOOCs), WeChat, DingDing, QQ, and Zoom) that schools and teachers could use to interact with learners remotely and therefore limit the interruption to education (Chen et al., 2020). Notwithstanding such effort, this sudden shift to the urgently developed courses assisted by internet and communication technology (ICT) was likely to induce strong pressures on both teachers and students which can substantially influence students' achievement emotions. Previous research demonstrated that emotions can have a sizeable impact on students' achievement and attitudes in both traditional and online learning environments and thus are crucial for gauging the effectiveness of ICT courses (Artino Jr & Jones II, 2012; Buil et al., 2016; Pekrun et al., 2011). However, to date, little is known about the factors that might influence students' affective experiences towards the pandemic-driven online courses.

Several studies have documented that teachers' ICT competence (Schmidt et al., 2009) and pedagogical design (Skinner & Belmont, 1993) can greatly enhance students' online second language (L2) learning by supporting technological efficacy, promoting motivation for e-learning, facilitating content comprehension, and fostering engagement in collaborative discussion (Darling-Aduana & Heinrich, 2018; Fryer & Bovee, 2016; Xu et al., 2020). However, studies have yet to examine how students' perceptions of teachers' ICT competence and provision of or lack of teaching structure affect students' cognitive appraisals and emotions for online L2 learning courses. The need to investigate the influence of these two teaching factors on students' appraisals and emotions has become even more relevant in the present EFL (English as a foreign language) context given that English is a required subject for Chinese university students and they must pass the exam to obtain their degree under the crisis-promoted online L2 learning environment of the COVID pandemic.

The current research draws on Pekrun's (2006, 2018) control-value theory (CVT) of achievement emotions to investigate the teaching and appraisal antecedents of students' online learning emotions. According to CVT, aspects of the learning environment such as teaching characteristics are viewed as distal antecedents of achievement emotions which may influence students' emotions directly or indirectly via students' perceived control and value on achievement activities and outcomes. These assumptions, however, have only been tested in face-to-face classrooms focusing on students' emotions for learning STEM (science, technology, engineering and mathematics) subjects (Goetz et al., 2020). Because of the domain-specific nature of achievement emotions (Shao et al., 2023), it is important to investigate emotions and their antecedents in different subjects such as language learning. Therefore, to cover these research gaps, the present study examines the extent to which two crucial teaching factors,

namely, students' perceived teacher ICT competence and chaotic teaching structure (CTS), directly and indirectly impact their L2 enjoyment, anxiety and boredom through perceived control and value in the context of Chinese tertiary online language classes during the global pandemic.

2 | LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 | Emotions in online learning

The importance of students' emotions has been well-established in traditional classrooms (Pekrun & Perry, 2014), however, their role in online learning environments has received increased attention only in the last decade. Among the early studies, Artino Jr and Jones II (2012) examined the relations between three achievement-related emotions and self-regulated learning behaviours in a self-paced online course. Results showed that enjoyment was positively associated with elaboration and metacognition while frustration and boredom were negatively associated with these learning behaviours. Recently, Ding and Zhao's (2020) study revealed that in general, positive emotions (i.e., enjoyment and excitement) were positively related to students' engagement in MOOC whereas negative emotions (i.e., boredom and annoyance) were negatively related to engagement. These studies suggest that students' positive and negative emotional experiences can have a considerable effect on a number of online learning outcomes, and they may also be considered as important educational outcomes in their own right, providing key insights into the online learning experiences of students. Given that online learning has become the only way for many university students to fulfil their degree requirements in the COVID context, it is conceivable that emotions may exert an even larger impact on students' learning in general and L2 learning in particular.

Empirical evidence suggests that teaching factors specific to online learning environments might trigger a wide range of learners' discrete emotions (Hilliard et al., 2020; Zhang & Lin, 2020). During the COVID pandemic, the issues concerning teachers' technological and pedagogical competence have become apparent as many teachers around the world, including language teachers, had to move suddenly from face-to-face education to a new format for which they were not prepared. Given that technology use places considerable demands on teachers in the current landscape, it is conceivable that merely introducing technology to the educational process and expecting them to deliver what was originally planned for a face-to-face instruction in an online format would cause problems, such as creating a CTS. In accordance with this concern, a recent large-scale study investigating online teaching quality during the COVID pandemic among 57 universities in China, Hu and Xie (2020) showed that the majority of teachers and students were not familiar with online education, the teaching design and structure failed to meet the students' expectations, and students had difficulties in regulating their own learning. Such teaching conditions may seriously influence students' affective

experiences (e.g., increase feelings of distress) and performance in online L2 learning (see Jung et al., 2012). Despite their pivotal importance, there is currently a lack of empirical research exploring how the crisis-prompted online language teaching practices are perceived by students and how these perceptions impact their emotions, which are crucial indicators of online L2 learning success.

2.2 | Teachers' ICT competence and chaotic teaching structure

Teachers' ICT competence refers to 'a series of knowledge and skills that teachers must acquire in various technological resources so they can introduce them completely into their teaching practice' (Almerich et al., 2016, p.112). As key agents in integrating ICT into education, teachers' ICT competence is essential for student access, engagement, motivation, control and value beliefs and attainment in online learning environments (Darling-Aduana & Heinrich, 2018; Fryer & Bovee, 2016, 2018). In their technological pedagogical content knowledge (TPACK) framework, Mishra and Koehler (2006) asserted that for effective ICT integration in teaching and learning, teachers do not only need to have knowledge on pedagogy, content, and technology, but they also need to know how these aspects are interlinked. More specifically, TPACK consists of three core components of knowledge (pedagogy, content and technology), and four components which are formed at their intersections, namely pedagogical content knowledge, technological pedagogical knowledge, technological content knowledge and technological pedagogical knowledge (see Schmidt et al., 2009 for a detailed description). TPACK is widely embraced as a solid framework and supported empirically for teacher education programs and research in addressing problems relating to integrating ICT in education (Schmidt et al., 2009).

In the COVID context, students' perceived teacher competence to provide them with technological and pedagogical support bears significant importance for reducing students' distress and anxiety towards online learning and improving their motivation and productive behaviours (Hicks et al., 2021). Students expect teachers to possess adequate ICT competence that will help them to deliver a course with an innovative design, interesting interactive features and responsive feedback rather than merely transform traditional lecture content to a new platform (Hicks et al., 2021). This draws heavily on teachers' ability to synthesize pedagogical content, lesson structures, and technological use in a short period of time. Recent evidence also suggests that students' perceptions of teachers' active role in online courses (e.g., more presence and interactive dialogue) play a crucial role in helping them to keep track of time, lowering their anxiety, and improving e-learning efficacy and satisfaction, particularly for the subject of language learning (Aysel, 2021).

Another critical aspect of quality online learning is teachers' provision or lack of provision of teaching structure (i.e., CTS) (see Jung et al., 2012). Structure is conceptualized as "the amount and clarity of the information teachers provide to students about what is expected and how they can realize those expectations" (Reeve, 2009, p.165).

In a well-structured learning environment, teachers provide structure by (a) setting clear goals and communicating their rules and expectations before a learning activity, (b) monitoring students' progress and providing appropriate help and guidance during a learning activity, and (c) identifying students' weaknesses and strengths and giving feedback accordingly after a learning activity (Reeve, 2009). In contrast, chaos occurs when teachers fail to establish clear directions, offer support or give constructive feedback which makes it more difficult for students to focus on their learning and progress, and to develop their competence (Aelterman et al., 2019).

The quality of an online learning environment (i.e., well-structured or chaotic) matters for important educational outcomes such as students' control and value beliefs, motivation, satisfaction, emotions, and performance (Hew et al., 2020; Hu & Xie, 2020). For instance, Jung et al.'s (2012) study identified that poor instructional design (e.g., lack of clear expectation for group tasks) was one of the most important factors for causing Japanese university students' stress in an online collaborative class using English as the main medium of instruction. In contrast, a well-designed online classroom with good teaching practices such as monitoring student behaviour and managing instruction pace is positively related to students' positive emotions but negatively related to their negative emotions (Gold & Windscheid, 2020). Given that the outbreak of COVID has fundamentally disrupted teaching and learning practices and allowed little time for many teachers to provide well-structured online classes for their students (see Moorhouse & Kohnke, 2021), students' perception of a CTS can decrease their perceived control and satisfaction for online learning but increase their anxiety and non-productive learning behaviours (Hicks et al., 2021). For an online language class, the demand for elaborate course design and management may be even higher, as language subjects often require more interaction between teachers and students (Zhang & Lin, 2020). Language teachers' instructional structure, experience and practice may play a key role in supporting students undergo a smooth transition from face-to-face classrooms to online learning. Consequently, it is important to know the effects of the pandemic-driven online L2 teaching practices on students' perceptions and affective experiences so that pedagogical adjustment can be made.

2.3 | Control-value theory of achievement emotions

We employed Pekrun's (2006) CVT of achievement emotions as a theoretical framework to examine the relations between perceived teaching characteristics, students' perceived control and value and achievement emotions in the present study. Achievement emotions are defined as 'emotions that relate to achievement activities or achievement outcomes' (Pekrun, 2006, p. 317). In a series of qualitative and quantitative studies, Pekrun et al. (2011) identified a number of emotions (e.g., enjoyment, hope, pride, anxiety, shame, and boredom) that were most commonly reported by students in academic

settings. These emotions are further differentiated from each other in a three-dimensional taxonomy which combines the valence (positive or negative), activation (activating or deactivating), and object focus (prospective, concurrent, or retrospective) dimensions. We focused on three of these emotions: enjoyment (positive activating), anxiety (negative activating) and boredom (negative deactivating) which represent three prototypes of achievement emotions and are the most frequently examined emotions in education and language contexts (Shao & Parkinson, 2021). While enjoyment has become the most studied positive emotion in the field of L2 learning in recent years (Shao et al., 2023), anxiety (Kutuk et al., 2022) and boredom (Pawlak et al., 2022) are recognized as the most experienced and observed negative emotions in language classes.

According to CVT, achievement emotions are induced by appraisals of achievement related control and value, which are proximal determinants of these emotions (Pekrun, 2006). Perceived control refers to the extent to which students believe that they can exert causal influence over the learning process and outcomes. Perceived value refers to the degree of importance students attach to learning activities and outcomes (Pekrun, 2006), and can be intrinsic (e.g., valuing English because it is interesting), attainment (i.e., valuing doing well in an English exam) and utility (i.e., valuing English because it relates to one's future plans) (Eccles, 2005). Different combinations of control and value elicit different achievement emotions (Pekrun & Perry, 2014). For instance, enjoyment is instigated when students feel that they can master the learning material (i.e., high control) and when they value the learning material (i.e., high value). In contrast, students experience anxiety when they believe that they cannot master the learning material (i.e., low control), especially in high-value learning activities. Boredom is induced when learning activities are not valued (i.e., low value), and students' control is either too low or too high, indicating a possible curvilinear relationship between students' appraisals of control and boredom (Pekrun et al., 2010).

In CVT, teaching reflects a key facet of the learning environment which functions as a distal antecedent of achievement emotions (Pekrun & Perry, 2014). Teaching characteristics are assumed to have an indirect effect on students' emotions via their cognitive appraisals (i.e., perceived control and value) of the learning environment which are more proximal antecedents of achievement emotions. Teaching factors such as teachers' emotions and behaviours may also influence students' emotions directly without conscious appraisals (Frenzel et al., 2007; Pekrun & Perry, 2014), although evidence is largely lacking as to which aspects of teaching directly and indirectly impact students' discrete emotions. Recently, Goetz et al. (2020) examined the influence of perceived supportive presentation style and excessive lesson demands on students' achievement emotions via control and value appraisals. Results showed that the direct and indirect effects of teaching on students' emotions differed depending on the combinations of appraisals and emotions.

CVT has been proven to be an effective tool for studying antecedents and outcomes of achievement emotions in online learning environments (see a special issue edited by Artino Jr, 2012). In their recent meta-analytic review, Loderer et al. (2020) examined the relations between a number of achievement emotions and their antecedents and outcomes in online learning environments. This research not only has demonstrated the applicability of CVT to these environments, but it has also highlighted that CVT has the potential to inform the design of effective online teaching and learning environments. Achievement emotions can play a critical role in several important achievement outcomes such as attention, motivation, and performance in online learning environments (Loderer et al., 2020). It may be expected that while negative emotions such as anxiety hinder students' learning progress, positive emotions such as enjoyment support it by, for example, increasing their attention or motivation (Parker et al., 2021). However, within the CVT framework, achievement emotions 'are more than a simple dichotomy of positive and negative emotions' and hence, their influence on learning is more complex and multifaceted which calls for greater scholarly attention (Xing et al., 2019).

Situated within the new online learning context of the COVID pandemic, it is apparent that students' control and value appraisals and achievement emotions towards language learning will be challenged due to considerable uncertainty. Foreseeable issues may include underprepared lesson structures and contents, various ICT interruptions (e.g., lack of internet access or inadequacy of students' technical knowledge), and insufficient paralinguistic input (e.g., lack of eye contact or facial expressions). These issues are likely to undermine students' perceived control and value about the quality of online L2 learning (Hu & Xie, 2020; Zhang & Lin, 2020). This would, in turn, cause negative learning experiences for students such as experiencing anxiety and boredom (Hicks et al., 2021). CVT explains that with proper support of the learning environment, students' control and value appraisals and achievement emotions can be changed or improved. Accordingly, in the COVID context, teachers' ability to quickly adjust to online language teaching and provide students with sufficient technological and pedagogical support are crucial for moderating students' control and value appraisals which can have direct and indirect effects on students' achievement emotions towards online learning.

A growing body of evidence demonstrates that achievement emotions and their antecedents are likely to be organized in context and domain specific ways (Goetz et al., 2007; Loderer et al., 2020; Pekrun et al., 2011). However, past research on achievement emotions has predominantly focused on math-related subjects, and CVT has only recently been used to explore student emotions in the domain of L2 learning (Davari et al., 2020; Shao et al., 2019, 2020). Since English is a core university subject in China and critically important for students' academic success, career development and progression, it is likely that learning English induces high pressure and strong emotions among students, especially in the present online L2 learning environment where the interactional dynamics among teachers, peers and students is largely compromised (e.g., speech or paralinguistic).

2.3.1 | The present study

Situated in the COVID EFL online learning context and based on CVT of achievement emotions, we hypothesize that students' perceptions of teaching characteristics (i.e., teachers' ICT competence and CTS) and their achievement emotions are related, and this relationship is mediated by students' cognitive appraisals (i.e., control and value). Specifically, our study addressed the following three research questions:

1. What are the relations among teaching characteristics, cognitive appraisals and achievement emotions?
2. Will control and value appraisals mediate the relationship between perceived teacher ICT competence and achievement emotions?
3. Will control and value appraisals mediate the relationship between perceived CTS and achievement emotions?

3 | METHOD

3.1 | Participants and procedure

The sample consisted of 1503 undergraduates (796 males and 707 females; $M_{age} = 19.11$ years; $SD_{age} = 0.89$) from 10 universities across different regions of China, studying in a diverse range of majors (e.g., science, engineering, finance, economics, social sciences, and liberal arts) and the majority of whom were freshmen (91.7%) as English is the required subject only for first-year university students in China. At the time of data collection, participants had an average of less than 1 year's ($M = 0.92$ year) online EFL learning experience and 39.3% of them had no experience with online education. Participants were attending a national mandatory online English course during the COVID pandemic as part of their degree requirement. They used *New College English* as their textbook for the online course. The level of the course was between intermediate to upper-intermediate levels. The course comprised of teacher lead-in activities, teacher and student interactions, in-class reading and after-class exercises with a focus on communication. Most of the course teachers did not have online teaching experience (Hu & Xie, 2020) and the communication purpose of the course (especially for peer discussion) was largely compromised by the online learning environment of the COVID pandemic.

To obtain a convenience sample, we contacted relevant English teachers who were teaching online courses and agreed to recruit participant for this research in each university. Due to administrative regulation and different online teaching schedules set up for respective universities during the COVID outbreak, we were allowed to access participants on only one occasion; therefore, the research design was cross-sectional. As the survey contains questions pertaining to teacher characteristics, we asked each teacher to refrain from mentioning the research to their students to avoid possible compliance related issues. Instead, a class representative was assigned to cooperate with the researchers and oversee the online questionnaire completion of their fellow students. The class representative first invited their classmates to join an online communication group created by the researchers using QQ or Wechat (the two most-used communication software in China). After the researchers briefed participants on the purpose of the study and the voluntary and anonymous nature of participating, participants could then access the questionnaire either by scanning a two-dimensional digital code or clicking a web link. Fifty-six students failed to complete the survey; their partial data were subsequently discarded. Participants answered the Chinese translated questionnaire and research assistants were available to answer questions during data collection. Institutional Review Board ethical approval was obtained, and the research was conducted in accordance with the American Psychological Association's ethical principles regarding research with human participants. The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

3.2 | Instruments

The questionnaire was created using an online survey development tool (i.e., WenJuanXing) and posted on the platform's webpage. The questionnaire included socio-demographic information, such as gender, age, and years of online learning experience (see Supplementary Materials S1). Among all of the self-report scales, teacher ICT competence and CTS did not have a Chinese validated version, and these two scales were translated from English into Chinese and back-translated by a team of bilingual researchers. For students' perceptions of control and value and achievement emotions, we used the Chinese version of the scales which were recently validated by Shao and Parkinson (2021). All items of the focal variables were rated on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). A pilot test was also conducted among 218 students to check the wording and internal consistency of the translated scales. All items demonstrated excellent item-total correlations $r_{it} > 0.40$ and reliability (Cronbach's $\alpha > 0.75$) and validity (CFIs ≥ 0.95; TLI ≥ 0.95; RMSEAs ≤ 0.08 and SRMRs ≤ 0.04) were also good to satisfactory for all scales. Participants in the pilot study were excluded from the final dataset.

3.2.1 | Teacher ICT competence and chaotic teaching structure

Students' perceptions of teacher ICT competence were assessed by a six-item scale adapted from the TPACK scale (Schmidt et al., 2009). The scale assesses students' perceived teacher competencies for integrating technology with teaching for enhancing students' learning. As the item contents of the original TPACK scale were formulated for teachers and tapped into four subjects of learning, we reformulated the content of all items by using the same stem 'In this online English class, my teacher…' as the referent to the present online EFL context (e.g., 'In this online English class, my teacher integrates technologies

TABLE 1 Confirmatory factor analyses: Factor loadings and fit indices

	Factor loadings	χ^2 (df)	CFI	TLI	RMSEA	SRMR
Teacher ICT competence	0.80–0.88	51.95 (9)	0.99	0.99	0.056	0.013
Chaotic teaching structure	0.54–0.78	62.38 (9)	0.97	0.95	0.078	0.036
Control	0.43–0.87	35.36 (5)	0.99	0.98	0.064	0.016
Intrinsic value	0.67–0.83	30.78 (2)	0.97	0.95	0.065	0.021
Attainment value	0.63–0.83	26.16 (2)	0.99	0.99	0.045	0.010
Enjoyment	0.81–0.87	61.08 (5)	0.99	0.98	0.058	0.020
Anxiety	0.63–0.86	64.04 (5)	0.99	0.97	0.068	0.030
Boredom	0.79–0.88	47.41 (5)	0.99	0.99	0.028	0.007
Measurement model						
First half	0.38–0.88	2285.95 (712)	0.95	0.94	0.055	0.056
Second half	0.43–0.88	1588.57 (712)	0.95	0.95	0.041	0.043

Note: Factor loadings are standardized coefficients. All factor loadings and χ^2 values are significant at $p < 0.001$.

Abbreviations: CFI, comparative fit index; RMSEA, root mean square error of approximation; SRMR, standardized root mean square residual; TLI, Tucker–Lewis index.

with learning materials and teaching methods smoothly'; $\alpha = 0.94$). Students' perceptions of CTS were assessed by six items adapted from the Teacher Provision of Structure subscale of the Teacher as Social Context Questionnaire (Skinner & Belmont, 1993). The scale measures the extent to which students perceive their teacher to be unclear in their expectations, lesson plans and adjustment of teaching strategies (e.g., 'In this online English class, my teacher doesn't make it clear what he/she expects from us'; $\alpha = 0.80$).

3.2.2 | Control and value appraisals

Students' perceived control was measured by a short-version of Marsh and O'Neill's (1984) Self-Description Questionnaire (SDQ), consisting of five items assessing students' self-concept in the online English course (e.g., 'In this online English class, I have done well'; $\alpha = 0.86$). Students' perceived value was assessed by two four-item subscales adapted from the Task Value Questionnaire (Pekrun & Meier, 2011). The two scales measured students' intrinsic value and attainment value related to the online English course (e.g., 'I find this online English class very interesting'; $\alpha = 0.87$; 'My primary goal in this online English class is to get good marks'; $\alpha = 0.82$). The Chinese validated version of the control and value scales (Shao & Parkinson, 2021) was used for the present research.

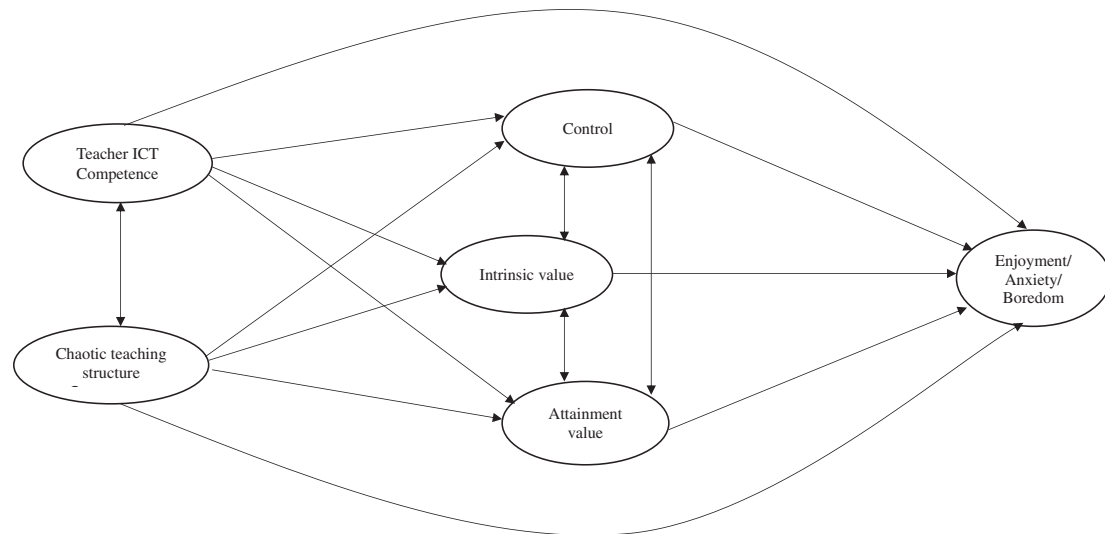### 3.2.3 | Achievement emotions in online learning

Students' emotions towards the online English course were assessed by three emotion subscales: enjoyment, anxiety and boredom, adapted from the Achievement Emotions Questionnaire (AEQ; Pekrun et al., 2011). The class-related subscale of the AEQ was adapted and used in the present study and it has also recently been validated in a Chinese EFL context (Shao & Parkinson, 2021). Each emotion subscale

consisted of five items and asked students to report their enjoyment (e.g., "I enjoy this online English class"; $\alpha = 0.92$), anxiety (e.g., "I feel anxious in this online English class"; $\alpha = 0.86$) and boredom (e.g., "I get bored in this online English class". $\alpha = 0.92$) in the online English class.

4 | DATA ANALYSIS

Data were analysed in three stages using latent structural equation modelling (SEM) with M*plus* 8.0 (Muthén & Muthén, 2019). Scores from all measurement scales were standardized before the analyses. First, a series of confirmatory factor analyses (CFA) were performed to check the measurement properties of each construct (Table 1). Second, we conducted a test–retest CFA for the measurement model by randomly splitting the sample into two halves while allowing all latent variables to correlate in each half (Byrne, 2011). Third, to test the mediation assumptions, we ran SEMs with the two factors of teaching characteristics (teacher ICT competence and CTS) as predictors, appraisals of control and (intrinsic and attainment) value as mediators and students' emotions (enjoyment, anxiety, boredom) as outcomes (Figure 1). Thereby, we ran every model separately for each respective emotion, resulting in three mediation models estimating the hypothesized direct and indirect effects on emotion.

As participants in our study were nested within teachers (with students at level 1 nested in teachers at level 2), this nesting data structure was taken into account by using the 'type = complex' command in M*plus* to control for biased parameter estimates. To handle possible non-normally distributed data, all analyses in the present research were conducted using robust maximum likelihood estimator (MLR). MLR estimates with standard errors and a chi-square test statistic are robust to non-normality and non-independence of observations when used with 'type = complex' (Muthén & Muthén, 2019). As

FIGURE. 1 Theoretical model of perceived teacher characteristics, cognitive appraisals, and emotions in online learning. Single headed arrows signify prediction and double headed arrows signify correlation.

TABLE 2 Descriptive statistics and Pearson product–moment correlations of the study variables

	M	*SD*	1	2	3	4	5	6	7
1 Teacher ICT competence	3.91	0.84							
2 Chaotic teaching structure	2.07	0.78	−0.63						
3 Control	3.28	0.80	0.58	−0.49					
4 Intrinsic value	3.25	0.93	0.60	−0.41	0.67				
5 Attainment value	3.97	0.73	0.30	−0.24	0.33	0.33			
6 Enjoyment	3.21	0.89	0.65	−0.49	0.72	0.75	0.29		
7 Anxiety	2.64	0.89	−0.42	0.43	−0.63	−0.44	−0.13	−0.55	
8 Boredom	2.42	0.99	−0.60	0.55	−0.63	−0.63	−0.24	−0.75	0.64

Note: All correlations were significant at *p* < 0.001.

all items in the online questionnaire were set up to be required (i.e., participants could not move on unless they answered the question), there were no missing data in the present research.

5 | RESULTS

Before conducting the main analyses, the measurement properties of the eight latent constructs under investigation were examined. We used both absolute and incremental fit indices to evaluate the model fit, including the comparative fit index (CFI), the Tucker–Lewis index (TLI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR) (Chen, 2007). CFIs ≥ 0.95, TLIs ≥ 0.95, RMSEAs ≤ 0.06 and SRMRs ≤ 0.08 are thought to indicate good fit, 0.95 ≥ CFIs ≥ 0.90, 0.95 ≥ TLIs ≥ 0.90, and RMSEAs between 0.06 and 0.08 reasonable fit, and RMSEAs between 0.08 and 0.10, SRMRs between 0.08 and 0.10 mediocre fit. As the chi-square value χ2 is sensitive to sample size, leading to biased rejection of the model, it was not used as an indicator in the

analyses considering the large sample size (Byrne, 2011). Results of the CFAs in Table 1 showed that each construct showed a good to excellent fit to the data. In the split-half procedure, the CFA results of the proposed measurement model indicated an adequate fit to both halves of the data. This confirmed the psychometric properties of each latent construct. The range of the factor loadings is also presented in Table 1.

5.1 | Correlations among teaching characteristics, appraisals and emotions (RQ1)

Descriptive statistics and Pearson product–moment correlations between the study variables in the overall sample were computed (see Table 2). All variables were significantly correlated with each other in the expected direction. The correlation between the two predictors, perceived teachers' ICT competence and CTS, was negative. Perceived teachers' ICT competence correlated positively with enjoyment and negatively with anxiety and boredom. In contrast, perceived
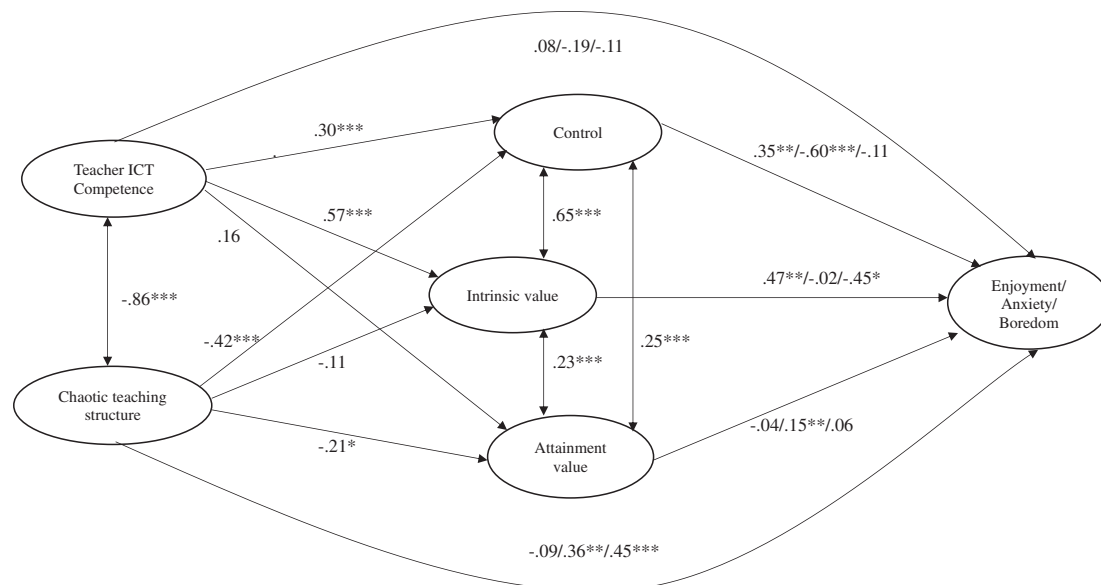
FIGURE. 2   Standardized parameter estimates of the mediation model for online learning emotions. *$p < 0.05$. **$p < 0.01$. ***$p < 0.001$. The significant levels of ß in the model take into account the relevant influences of all other predictors.

CTS was negatively related to enjoyment and positively to anxiety and boredom. Furthermore, students' perceptions of teachers' ICT competence correlated positively with their control and value appraisals. In contrast, their perceptions of CTS were negatively related to control and value. Also, as expected, higher levels of perceived control and value related to higher levels of enjoyment and lower levels of anxiety and boredom. The observed patterns of correlations provided the foundation for testing our mediation assumptions below.

5.2 | Mediation effects of control and value between teacher ICT competence and achievement emotions (RQ2)

Latent mediation analyses were run to test the hypothesis that the relations between students' perceived teacher ICT competence and achievement emotions were mediated by perceived control and value. The effect of each predictor variable on any given outcome in the mediation models needs to be interpreted by taking the effects of all other predictor variables into account. We first examined the direct influence of teachers' ICT competence on students' appraisals of control, intrinsic value and attainment value. As demonstrated in Figure 2, teacher ICT competence had significant positive effects on perceived control and intrinsic value, but no effect on attainment value. In the second step, we examined the effects of appraisals on emotions after controlling for the influence of teaching characteristics. The relations between appraisals and emotions were varied. While perceived control and intrinsic value had significant positive effects on enjoyment, there was no effect of attainment value on this emotion. For anxiety, control and attainment value exerted a negative and positive influence, respectively. However, intrinsic value did not have an influence

on anxiety. As for boredom, it was only intrinsic value that had a significant negative effect, controlling for the influence of control and attainment value.

Next, we tested the total and specific indirect effects of perceived teachers' ICT competence on the emotions through appraisals by testing the full mediation models. As reported in Table 3, perceived teachers' ICT competence yielded a significant positive total indirect effect on enjoyment and a negative total indirect effect on anxiety and boredom. The effects of perceived teachers' ICT competence on the three emotions were fully mediated by control and value appraisals. Breaking down the total indirect effects of the three appraisals into specific indirect effects revealed substantial differences between the three emotions. The specific indirect effects of perceived teachers' ICT competence on enjoyment via control and intrinsic value were positive and significant, but nonsignificant via attainment value. For anxiety, the effects were mediated through control, but not through intrinsic or attainment value. Regarding boredom, the only specific indirect effect was observed via intrinsic value.

5.3 | Mediation effects of control and value between chaotic teaching structure and achievement emotions (RQ3)

To determine the mediating effects of control and value in the relationship between perceived CTS and achievement emotions, we first estimated the direct regression coefficients among these variables. Perceived CTS had significant negative effects on students' perceived control and attainment value, but did not significantly affect intrinsic value (see Figure 2). The effects of appraisals on emotions were the same as reported in Section 5.2 since these variables were estimated

TABLE 3 Direct, total indirect and specific indirect effects

Effect	Enjoyment		Anxiety		Boredom	
	ß	SE	ß	SE	ß	SE
Direct effects						
Teacher ICT competence	0.08	0.08	−0.19	0.11	−0.11	0.12
Chaotic teaching structure	−0.09	0.06	0.36**	0.11	0.45***	0.10
Total indirect effects						
Teacher ICT competence	0.36***	0.08	−0.16***	0.05	−0.28***	0.09
Chaotic teaching structure	−0.20***	0.05	0.23***	0.07	0.08	0.04
Specific indirect effects						
Control						
Teacher ICT competence	0.10*	0.05	−0.17*	0.07	−0.03	0.05
Chaotic teaching structure	−0.15**	0.05	0.25**	0.08	0.05	0.06
Intrinsic value						
Teacher ICT competence	0.27**	0.10	−0.01	0.08	−0.26*	0.13
Chaotic teaching structure	−0.05	0.05	0.00	0.02	0.05	0.05
Attainment value						
Teacher ICT competence	−0.01	0.01	0.02	0.03	−0.01	0.01
Chaotic teaching structure	−0.01	0.01	0.03	0.02	0.01	0.01

Note: Values are standardized effects from structural equation models. $^*p < 0.05$. $^{**}p < 0.01$. $^{***}p < 0.001$.

in the same mediation models. Perceived CTS also had significant direct effects on anxiety and boredom, but not enjoyment. The final full mediation models revealed the total and specific indirect effects of perceived CTS on the emotions through appraisals. The results in Table 3 demonstrated that perceived CTS had a significant negative total indirect effect on enjoyment and a positive total indirect effect on anxiety through control-value appraisals. The total indirect effects of perceived CTS on boredom were nonsignificant. Examination of the specific indirect effects of perceived CTS on emotions shows that for enjoyment, the effects were fully mediated by control, but not by intrinsic or attainment value. For anxiety, control partially mediated the effects of perceived CTS; intrinsic or attainment values were not found to be mediators.

6 | DISCUSSION

Due to the COVID-19 pandemic, a large number of institutions transitioned from face-to-face to online instruction involving various domains such as second language learning. The present study sought to investigate the direct and indirect effects of two important aspects of the online instructional environment (i.e., perceived teachers' ICT competence and CTS) instigated by the unprecedented COVID-19 pandemic on students' language learning emotions (i.e., enjoyment, anxiety and boredom) through cognitive appraisals (perceived control and value). Overall, the results of our study provide evidence for the importance of online teaching quality and appraisals for students' emotional experiences in an online learning environment during the global pandemic and beyond.

6.1 | Correlations among teaching characteristics, appraisals and emotions (RQ1)

We found that students who believed that their teachers possessed the competence for integrating ICT into their online language classes during the COVID pandemic tended to perceive their teaching environment as well-structured. Such relationships are theoretically aligned with the TPACK framework suggesting that teachers' technological knowledge and pedagogical knowledge about classroom methods and processes (e.g., online classroom management or assessment for learning) may develop mutually, and that teachers are in a better place to provide their students with a well-structured online teaching environment when possessing such competences (Schmidt et al., 2009).

Students who hold positive perceptions of their teachers' ICT competence tend to experience higher enjoyment and lower anxiety and boredom. In contrast, when the online learning environment is perceived as chaotic, students experience higher levels of anxiety and boredom and lower levels of enjoyment. These findings imply that online teaching quality matters for, and can exert positive and negative influences on, Chinese university students' emotional experience towards online L2 learning during the COVID pandemic. They also parallel previous studies suggesting that teachers' ICT competence is a significant predictor of important educational outcomes such as student engagement and motivation in online learning environments (Darling-Aduana & Heinrich, 2018; Fryer & Bovee, 2016).

Students' positive perceptions of their teachers' ICT competence were related to higher levels of perceived control and value. In contrast, their negative perceptions of teachers' provision of structure

were related to lower levels of control and value. Also, as expected, higher levels of perceived control and value were related to higher levels of enjoyment and lower levels of anxiety and boredom. These results corroborate CVT's (Pekrun, 2018) assumptions suggesting that the quality of the learning environment, such as teachers' pedagogical and technological ability, can influence students' perceived competence beliefs and the value that they ascribe to learning (Jung et al., 2019). Students' control and value appraisals can in turn shape their achievement-related emotions in different domains of learning (Shao et al., 2020). Importantly, the present study extended previous findings in traditional classrooms by attesting to the universality of these correlations in the online L2 learning context of the COVID pandemic.

6.2 | Mediation effects of control and value between teacher ICT competence and achievement emotions (RQ2)

Appraisals of control and value fully mediated the effects of perceived teacher ICT competence on students' achievement emotions. The full mediation indicates that Chinese undergraduate students' perceptions of English language teachers' ICT competence are prone to influence students' emotions indirectly via perceived control and value rather than exerting a direct effect on their emotions. As mentioned earlier, both Chinese university teachers and students were unfamiliar with online education (Hu & Xie, 2020), and thus, students might have a more tolerant attitude towards their teachers' technological competence under the emergent and uncertain online learning environment of the COVID pandemic. Perceived teacher ICT competence might therefore exert influence on students' control and value rather than directly instigating strong emotional reactions in EFL online classes.

Furthermore, the three appraisals differed in their relative importance as mediators between perceived teacher ICT competence and achievement emotions. Specifically, perceived control and intrinsic, but not attainment, value mediated the effects of teaching on enjoyment. This is supported by CVT's assumption that enjoyment is generally instigated by students' high control and positive value over learning outcomes (Pekrun, 2006). For anxiety, perceived control, but not intrinsic and attainment value, served as a mediator. This is partly in line with CVT which proposes that anxiety is prone to be triggered by lack of control and high attainment value (as can also be seen from the direct effects of attainment value on anxiety in Figure 2; Pekrun & Perry, 2014). Regarding boredom, intrinsic value, but not control and attainment value, acted as a mediator. Consistent with CVT, boredom is induced when students have low value towards learning and achievement, coupled with either very high or low control (Pekrun et al., 2010). The non-significant mediating effect of control may be attributed to the U-shaped relationship between control and boredom counterbalancing the linear effects of control on boredom (see Pekrun et al., 2010).

Unlike previous research that has reported a mediating effect of attainment value between teaching and student emotions (Goetz et al., 2020), there was no evidence of such a mediation effect in the present online L2 learning context. A possible explanation for this might be that English was a compulsory subject for the Chinese university students participating in this research and therefore perceived as highly relevant for their future academic success and career prospects. As such, the students might have had a relatively fixed perception of attainment value, resulting in a lack of variation in their responses (see the high mean score and low standard deviation of attainment value in Table 1). In other words, no matter how students perceive teachers' ICT competence, their attainment value for studying English is unlikely to be affected. These findings highlight the need to consider the cultural context when employing the CVT framework to study the mediating role of specific appraisals between the learning environment and achievement emotions.

6.3 | Mediation effects of control and value between chaotic teaching structure and achievement emotions (RQ3)

Our study revealed that the relations between perceived CTS and enjoyment and anxiety were fully and partially mediated by perceived control, respectively. However, the mediation patterns (full vs. partial) of this teaching factor appeared to differ from those of teacher ICT competence. This highlights the importance of considering the nature of specific teaching characteristics when using CVT as a framework to interpret the research findings. The partial mediation of teacher's provision of or lack of structure on students' anxiety via perceived control in online L2 learning may be explained by the construct of CTS representing teachers' stable pedagogical competence/incompetence irrespective of the influence of the COVID pandemic. It is often conveyed through obvious teaching behaviours such as teacher-student interaction which is more readily observed compared with teacher ICT competence, and thus, can influence students' language emotions directly and indirectly (Khajavy et al., 2018). As for the full mediation of perceived control between CTS and enjoyment, this might be because CTS denotes a negatively valanced construct and is more likely to have direct contagious effects on negative emotions like anxiety and boredom than enjoyment (Shao & Parkinson, 2021). This was also supported by the direct negative effects of CTS on anxiety and boredom in Table 3.

Moreover, the results demonstrated that perceived control was the only mediator in the relations between perceived CTS and achievement emotions. These findings are in agreement with the propositions that teachers' provision of structure (vs. chaos) primarily nurtures students' need for competence (i.e., control) (Vansteenkiste et al., 2012). The construct of CTS was inclined to influence control beliefs, rather than value (Skinner & Belmont, 1993). The non-significant mediation effect of intrinsic value may also be attributed to the fact that the effect of positive teaching factors (i.e., teacher ICT competence) rather than negative teaching factors (i.e., CTS) on students' emotions is more prone to be mediated by intrinsic value (positive). The non-significant mediation effect of attainment value

between CTS and achievement emotions is likely to be due to the same cultural reason highlighted above (see Section 5.2). As for the non-significant mediation effect of perceived control between CTS and boredom, again, this may be due to a potential curvilinear relationship which might have led to a low predictive relationship for control on boredom (Pekrun et al., 2010). Overall, our results support but extend prior findings on CVT (Pekrun, 2006) by showing that the mediating role of appraisals between perceived teaching and achievement emotions can hold even in a crisis-promoted online L2 learning environment.

6.4 | Implications for practice

The present study has several implications for educational practice. First, findings suggest that perceived teacher ICT competence in online EFL classes is a critical antecedent of students' appraisals of control and value and their achievement emotions during the COVID pandemic. Accordingly, initial teacher education and continuous professional development programs should be designed in a way that prepares teachers and teacher educators for varying teaching formats including unplanned online teaching which might be introduced as a result of a forced and rapid switch to remote teaching. Institutions should also make long-term training for ICT competence to be readily available to in-service teachers to assist them to better integrate technological knowledge with pedagogical content and teaching methods (Hu & Xie, 2020). This will help them become more effective in integrating ICT in their teaching and develop their skills to adapt to new teaching environments with ease (see Kopcha, 2012). It will also increase the quality of the online L2 teaching and therefore students will have more positive perceptions of their learning environment which, in turn, will affect their appraisals of control and value as well as their achievement emotions.

Second, it is suggested that students' perceptions of CTS can negatively influence their control and value appraisals and emotions for online EFL learning during the COVID pandemic. Thus, EFL teachers should acquaint themselves with using various online platforms and software to communicate the goals, expectations, structures and requirements of their language lessons to students in a clear manner (Chen et al., 2020). Teachers should also be capable of checking students' pace of learning, monitoring their progress and providing immediate feedback in the remote L2 learning environment in and beyond COVID (Zhang & Lin, 2020). Teachers may also consider joining an individualized technology mentoring program to improve their pedagogical design for online language teaching (Aysel, 2021). It is advised that teachers ensure that the pace of online instruction as well as task complexity and difficulty are scaffolded in accordance with students' previous knowledge and readiness for online L2 learning. This may increase students' perceived control and value towards online language learning and help them alleviate feelings of anxiety and boredom and increase the likelihood of positive emotions such as enjoyment.

Third, our findings indicate that facets of teaching and appraisals differ in their relative importance as antecedents and mediators, respectively, with respect to specific achievement emotions in online EFL classes during the COVID pandemic. This suggests that online language teaching interventions aiming to increase or decrease a specific emotion could directly target specific combinations of teaching characteristics and appraisals. To promote students' enjoyment of online L2 learning, the full mediation of appraisals between teaching and enjoyment indicates that future interventions might focus directly on enhancing students' perceived control by utilizing an attributional retraining program (Hamm et al., 2020), as well as intrinsic value by highlighting the personal relevance of the task or topic (Shao et al., 2020) as an alternative to modifying teaching behaviours. The full and partial mediation of perceived control between teaching and anxiety suggests that interventions could attempt to decrease language anxiety both via modifying teaching structure with lesson expectations clearly expressed, students' learning progress properly monitored and questions timely answered, and/or via directly focusing on enhancing perceived control (e.g., via attributional retraining; Hamm et al., 2020). To reduce boredom, the optimal interventions might be through employing elaborate and innovative online L2 teaching designs such as visual illustrations and animation (Loderer et al., 2018) and literature-response activities (Shao et al., 2012) which are aimed at improving both teaching structure and intrinsic value.

7 | LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

Several limitations should be considered when interpreting the results of the present study. First, the research design was constrained to a cross-sectional format by the COVID crisis due to time pressure and institutional requirements. It is not, therefore, possible to infer causal relationships between the teaching characteristics examined here, control-value appraisals and achievement emotions. Nevertheless, the proposed directions between these study variables have strong support from both theory and past research (Goetz et al., 2020; Pekrun & Perry, 2014). The trait measures used in the present study for assessing teaching characteristics and students' appraisals and emotions are relatively stable over time (Pekrun et al., 2011) and cross-sectional design is the most relevant design when assessing the prevalence of attitudes and emotions (Kesmodel, 2018).

Furthermore, we measured all variables using self-report questionnaires which are susceptible to response bias (e.g., social desirability bias, memory recall). Although self-ratings have the unique advantage of accessing internal perceptions and feelings, the subjective nature of these measures is often difficult to control. Future research should also include objective measures such as peer ratings or implicit measures to assess teaching, appraisals and emotions. For instance, researchers may use video observation to record teachers' and students' behaviours and emotions in the L2 classes and analyse the relations between these variables. They may also ask peers to

report teachers' teaching competence and students' appraisals and emotions as an alternative assessment (Shao & Parkinson, 2021).

Further, the generalisability of our findings is limited to Chinese university students. It is possible that the relationships between the study variables vary depending on students' cultural background and online L2 learning settings. According to Jung et al. (2012), for instance, students from weak uncertainty avoidance cultures such as China might be more comfortable with online learning environments where they are not provided with clear guidance. However, in strong uncertainty avoidance cultures such as Japan, students might be more dependent on teachers' provision of structure (e.g., Fryer & Bovee, 2016), and lack of structure might lead to stronger negative emotional experiences. Given that students' way of learning varies depending on their cultural background, empirical research is advised to further examine the mediational effects of control and value appraisals between perceived teaching characteristics and online L2 learning emotions in different cultures.

8 | CONCLUSION

This study examined how Chinese university students' perceptions of teacher ICT competence and CTS influenced their learning enjoyment, anxiety and boredom directly and indirectly via appraisals of control, intrinsic value and attainment value in the online EFL context of the COVID pandemic. It was found that students' perceptions of teaching characteristics and appraisals of control and value contributed to their emotional experiences towards online language learning. The specific results varied for the three emotions depending on different combinations of teaching factors and cognitive appraisals. The findings of this study are expected to set an example for future research and pedagogical practice and call for attention from both school and government levels to provide teachers with sufficient technical training and support for the unprecedented shift to online teaching brought about by the COVID pandemic and possible similar situations in the future. The successful implementation of these urgently developed online courses rests not only on teachers' technological and pedagogical competence, but also on support and cooperation from all parties concerned.

PEER REVIEW

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DATA AVAILABILITY STATEMENT

Evidence suggests that students' achievement emotions are important contributors to their learning and success online. It is, therefore, essential to understand and support students' emotional experiences to enhance online education, especially under the COVID-19 context. However, to date, very few studies have investigated how students' achievement emotions might be affected by teaching and learning factors in online learning environments. Based on control-value theory of achievement emotions, this study examined the

influence of students' perceived online teaching quality and appraisals of control and value on their achievement emotions in an online second language (L2) learning context instigated by the COVID-19.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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