Research Article

The Road to Becoming a "Live-Streaming Star": Ecological Influences on Improvisation Efforts Among Teaching-from-Home Chinese English as a Foreign Language Teachers in the COVID-19 Outbreak

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Abstract: When the COVID-19 pandemic outbreak threw the world into a public panic, teachers worldwide were challenged to adapt to a new pedagogical ecology as online delivery of classes was widely made a required necessity. This study explores how language teachers responded to the sudden disruption via improvisational endeavours during the first online semester and how their endeavours were influenced by various ecological factors beyond the online classroom. Data were collected using a survey and interviews with English as a Foreign Language (EFL) teachers from three universities in eastern coastal China. The results showed that the participants' improvisation efforts featured limited preparation and creativity and a lukewarm willingness to try out new things while teaching from home. Ecological influences on the teachers' improvisation efforts were identified as a multitude of institutional, daily contextual, sociocultural, and personal factors that interacted in complex, less predictable ways. In general, the diverse sources of influence exerted a mixed impact on individual teachers' improvisation practices and performance. Sociocultural influence, in particular the "live-streaming star" meme, was found to be a unique source of inspiration and support. This exploratory study expands the research of improvisation in educational settings, which has largely been associated with pedagogical innovation to adapt to micro-level changes. In the emergency remote teaching scenario, innovative attempts made by individual teachers were subject to the meso-level and the macro-level ecological influences, which may overwhelm or deter practitioners. Apart from potential theoretical and pedagogical implications, the study offers insights into the nature and impact of crisis-prompted online teaching in and beyond the COVID-19 context.

Keywords: live-streaming, improvisation, English as a Foreign Language, crisis-prompted online teaching, ecological influences, COVID-19

1. Introduction

The COVID-19 pandemic outbreak challenged teachers worldwide to adapt to a new reality where teaching was massively moved online. While before COVID, many may probably have dreamt about the luxury of working from home, the practice was made mandatory for teachers at all levels during the quarantine. This sudden change turned out to be tough to cope with, especially among practitioners who lacked proper training and experience in distance education, who found themselves "grappling with the new online landscape" (Lloyd, 2020, p. 164). In China, where "the

world's largest scale of online teaching" took place (Xi, 2020), teachers across the country were called upon to follow the government mantra of "*tingke bu tingxue*" ('postponement of school without suspension of learning') by moving classes online (Guo et al., 2020). Though the idea of distance education had been widely known, this crisis-prompted working-from-home experience turned out to be many practitioners' first attempt at extended online teaching, and all had tried hard to adapt to the new virtual pedagogical reality. As Xu Jianzhong noted in his opening speech at the 2020 National "Star Teacher" Contest run by Foreign Language Teaching and Research Press, arguably the highest recognised teaching competition for English teachers in China, "In this very special and highly challenging condition of teaching, every front-line teacher has fought hundreds of battles and made him/herself a genuine 'star teacher'" (Chinese original, literal translation mine). Xu's remark cleverly punned at the "star" in the "*zhibo mingxing*" ('live-streaming star') meme, which had gone the rounds nationwide during the quarantine as teachers who taught synchronous online courses were jokingly referred to as "*zhubo*" ('live streamer') in the public discourse.

Given the sheer scale of its shift "from bricks and mortar to remote teaching" (Quezada et al., 2020), China has been the focus in a fast-growing line of explorations into the crisis-prompted online teaching scenario (e.g., Demuyakor, 2020; Guo et al., 2020; Wang et al., 2020). The current study joins this effort by investigating the experiences of a sample of Chinese English as a Foreign Language (EFL) teachers who had been working from home throughout the spring semester of 2020 (i.e., lasting from the end of February to the end of June). To keep classes going, these teachers were challenged to radically change their routine practices to adapt teaching materials, tools, designs, and methods to the virtual classroom. It would be worth exploring how they managed to survive this challenge despite professional and psychological unreadiness. Since the abrupt pedagogical changes were subject to crisis-induced changes in the broad and immediate context, they can be assessed and explored by delving into the ecology where these changes took place and where the teachers' decisions and practices were shaped.

The purpose of the current study is to provide evidence for a better understanding of how ill-prepared language teachers lived with the drastic changes brought by crisis-prompted online teaching and made efforts to adapt to the new pedagogical reality. However, "adaptation may not be the most apt word for what we've been through", one teacher remarked in her comment on my earlier draft plan for the study, "because at the beginning, it was all like improvising". Inspired by this impressive summary of her experience, I set out to investigate what might be considered "improvisation" efforts individual teachers made during their "pre-adaptation" stage when the pandemic first hit all unprepared and when things were "messy", and challenges were probably the greatest for practitioners to restore order to their classes.

In the following sections, I will first review how improvisation is conceptualised in various fields and disciplines and how it has been conceived and applied in language teaching and the pandemic research scenario. Then, I will establish the relevance of an ecological perspective to investigating crisis-prompted online teaching practices regarding improvisation efforts towards change and adaptation. After identifying the limitations of the existing studies and methods, I raised the questions for the current study and described my research design and procedures, with details about data collection and analysis. Afterwards, I will present and discuss my findings on the teachers' improvisation efforts in their teaching-from-home practices and the ecological factors that went into shaping their practices. These findings are then summarised to illustrate how improvisation intention and efforts can be subject to different levels of ecological influences, which interact in complex, less predictable ways in an emergency. For a preliminary conclusion, I will consider the pedagogical implications of the findings and possible lines of further enquiry.

2. Literature review and theoretical framework
2.1 *Improvisation as a researchable topic*

With its Latinate root improvisus ("unforeseen") carrying a sense of unpreparedness, "improvisation" is often seen as intrinsically "a musical metaphor" imbued with artistic indecision and fuzziness that are generally eschewed by social scientists (Montuori, 2003, p. 239). Nevertheless, the idea has made its way into various topics across domains of study, including music, theatre, management, entrepreneurship, memory, neural network, sociology, sports, firefight (see Ben-Horin, 2016), and more recently, healthcare (Wiedner et al., 2020). Though contexts vary, improvisation was uniformly conceptualised as a situated activity or event with a lack of predictability and readiness. This understanding was later expanded in enquiries that explored diverse features of situation-based improvisational practices, including

unpreparedness, creativity, and simultaneity (Ben-Horin, 2016).

In comparison with its cross-disciplinary popularity, improvisation does not seem to have received as much scholarly attention in education research and practice. On the one hand, preparation, an ingredient that is distinctively missing in improvisation, is often underscored as essential to successful teaching and learning practices, typically in teacher education and training (Darling-Hammond, 2006). On the other hand, the creative dimension of improvisation has been positively recognised for its potential value in sparkling teachers' creativity as it is believed that teaching as "improvisational performance" encourages "constructivist, inquiry-based, and dialogic teaching methods that emphasise classroom collaboration" (Sawyer, 2004, p. 12). Early observations of these teaching methods were made by McCollum (1989), who took note of the strategies, including "doing nothing", "getting through", "opening the floor", and "accepting the unexpected" (McCollum, 1989, p. 139) that teachers improvised to restore a disrupted interactional order in a class with North American and Puerto Rican students. As such, improvisation can serve as a remedial approach to address an undesired, unexpected change or disruption in the immediate teaching environment (McCollum, 1989), thus a 'crisis' management strategy.

Meanwhile, teachers' improvisational practices have been argued to confer a unique value "to aid a learning/ teaching situation" (Heathcote, 1967, p. 28), as impromptu practices can play an active role in creating an enabling and engaging classroom (Maheux & Lajoie, 2011; Wright, 2019). In practice, improvisation has been employed to enhance teacher-pupil interactions in early childhood classrooms (Graue et al., 2014; Lobman, 2006), where the term was operationalised as teachers' ability to "build on diverse information to enrich their educational interactions with children" (Graue et al., 2015, p. 14). Young learners aside, studies have also been conducted to validate the benefit of improvisation activities among adolescent learners, tertiary-level students (Berk & Trieber, 2009; Lavik, 2021) and pre-service teachers (Zondag, 2021).

Moreover, improvisation has been shown to offer evidence that helps differentiate between expert and novice teachers (Borko & Livingston, 1989). Previous research found that experienced teachers tended to improvise more often and more competently in class than their novice counterparts, a finding that suggested a connection between pedagogical improvisation and teaching performance (Sawyer, 2011; Thomas & Berry III, 2019). Therefore, to help improve novice teachers' ability to improvise for better teaching practices, disciplined improvisation has been proposed to be incorporated into teacher training programs (Philip, 2019; Sawyer, 2004).

In sum, improvisation has gone beyond its artistic origin and received some serious research attention across disciplinary areas. Though operational definitions vary regarding the measurement of unpredictability and creativity involved in what is deemed an improvisational practice, understandings tend to converge on the defining features of improvisation as being unplanned yet functional. That is, the absence of specific preparation has the potential to address an immediate need or improve previous practices or situations. In the classroom setting, improvisation is often perceived as an undefined range of unrehearsed practices with the potential to fix the immediate context of instruction, enrich educational interactions, and encourage learning. A relatively recent addition to teachers' skill set, improvisation has been associated with experience and competence, and one's improvisation skills can be cultivated through disciplined endeavour. Overall, in the pre-pandemic literature on improvisation, the positive sense of the term has been exploited to turn unprepared practices into conducive affordances for teaching and learning.

With a shared focus on the hidden value of unprepared practices in education, this line of studies sheds a positive light on improvisation. A more mixed and nuanced reading of the term was introduced by the growing research on the COVID-19 pandemic that targeted improvisation as one keyword (e.g., Cox et al., 2021; Felepchuk & Finley, 2021; Ferlin et al., 2021; Lavik, 2021; Midha, 2021). With diverse scopes ranging from "quite considerable improvisation" nationwide (Ferlin et al., 2021) to inspired activities in a graduate thermodynamics class (Lavik, 2021), these studies investigated the lack of preparedness (Ferlin et al., 2021; Midha, 2021) and efforts of innovation (Cox et al., 2021; Wiedner et al., 2020) in the responsive actions of the public and professionals.

In the pandemic situation, however, there arises a need to reconsider the meaning of improvisation. This is because its previous conceptualisations fall short of conveying what improvisation means to individual teachers caught in a crisis, the impact of which far exceeds temporary, harmless disruption in the classroom. While in both contexts, improvisation is triggered by some unanticipated incidents, the responsive measures differ in purpose, intensity, and scale. In the pandemic situation, virtually all classrooms were affected, with varying degrees of interruption and difficulty in restoring order. To put it in perspective, we may compare two possible scenarios where improvisational

efforts are needed. First is when a teacher shifts to distance teaching during his/her recovery from temporary immobility caused by an accidental fall. The second is that in a public health crisis, teachers around the world are challenged to move their classes online to keep education going. Though both scenarios evoke efforts to improvise to adapt to the new environment, the scale and impact of the responsive actions differ in remarkable ways. The existing studies mainly focused on teachers' efforts to deal with unexpected situations in teaching, with understandably little discussion of how large-scale, prolonged changes in the environment could shape the improvisation efforts of individual practitioners in both direct and subterranean ways. Hence, for a more in-depth and nuanced understanding of improvisation in times of emergency, the current study contextualises the term in an emergency remote education setting and operationally conceptualises it as teachers' responses to the sudden change from in-person classes to online instruction.

Drawing upon the growing literature and the observations and reflections I made during the early stage of the data collection, the study focuses on two dimensions that have been targeted in the literature concerning the definition and measurement of improvisation. One dimension addresses preparedness, which is meant to evaluate individual teachers' readiness for teaching online classes in the widespread shift to online learning due to the pandemic. The other dimension deals with creativity, which is meant to identify any routine-breaking endeavour individual teachers attempted in response to the changes in the pedagogical ecology. However, it should be noted that this operationalisation of improvisation intends to capture different profiles of teachers who were adapting to changes that arose from moving classes online. Other aspects of improvisation (e.g., simultaneity, spontaneity), though possibly equally valid when applied to practices contextualised in other educational scenarios or disciplines, were unaddressed in the current study because they tend to be more relevant to one-time practices than sustained practices towards change and adaptation.

2.2 *Crisis-prompted online teaching*

During the COVID-19 pandemic, schools around the globe were challenged to pivot to a distance education environment within a short period of time, making it mandatory for faculty to teach online, although many were scarcely trained and ill-prepared for the mission (Ersin et al., 2020; Whalen, 2020). As such, planning and preparation, faculty readiness, and crisis response make the top research topics across contexts and disciplines (Coyne et al., 2020; Cutri & Mena, 2020; Ersin et al., 2020; Gacs et al., 2020; Quezada et al., 2020; Rodić & Rodić, 2020), with a special interest in "the first global online semester" (Bond et al., 2021) when faculty were first confronted with the radical and immediate transformation from in-person to virtual instruction (Marek et al., 2021). The crisis has exacerbated some of the conventional concerns about online education, such as internet access, cost of class delivery, and efficacy of teaching and learning (Bennett et al., 1999). It has also brought to the fore the fragility and immaturity of the educational system in dealing with emergencies (Coyne et al., 2020).

As interaction-intensive classes are generally considered susceptible to the sudden change in the instructional environment, a number of studies have focused on language education during the COVID-19 quarantine (e.g., Celik et al., 2022; Cheung, 2021; Gacs et al., 2020; Moser et al., 2021; Sun, 2022; Zou et al., 2021; Zou et al., 2021). To begin with, there has been a generally recognised need to differentiate online teaching prompted by the public health crisis from online instruction in a general sense. As emergency remote teaching, it is "a temporary shift of instructional delivery to an alternative delivery mode due to crisis circumstances", which "involves the use of fully remote teaching solutions for instruction or education that would otherwise be delivered face-to-face or as blended or hybrid courses and that will return to that format once the crisis or emergency has abated" (Hodges et al., 2020). Therefore, due to a lack of deliberate and planned efforts, crisis-prompted online teaching practices can be seen as an unwilled response to address a practical need in the crisis. Empirical research has mainly focused on the process and outcomes of online teaching, e.g., preparation (Zou et al., 2021), interaction (Nguyen et al., 2022), and effectiveness (Zou et al., 2021); yet further efforts are needed to draw insights from individual teachers' lived experiences (Marek et al., 2021).

Meanwhile, studies have revealed the complex sources of influence that have operated on teachers' decisions and actions involved in moving classes online (Moser et al., 2021). Alongside personal factors such as identity, belief, background, and experience, contextual influences in relation to the social and institutional settings have been reported to have a bearing on teachers' adaptive practices, in particular regarding technology integration (Cheung, 2021; Sun, 2022). Nevertheless, evidence is still lacking for extensive influence from the complex physical and sociocultural surroundings teachers were situated in while they were teaching from home during the ongoing pandemic.

In general, mounting evidence has established the unique value of investigating and reflecting on the pandemic-

initiated online teaching. Much research attention has been given to crisis-prompted online teaching as an emergency pedagogical practice - what the sudden change from in-person to distance teaching has brought, how the change has been addressed, and how well the change has been adapted to. And yet not much has been revealed of other sources of changes - ones that went beyond the virtual classroom. As teachers were members of the community in a collective battle against the pandemic, their teaching practices could also be perceived as situated responsive actions individuals undertook to help establish and maintain a new order in the quarantine, and hence they were subject to a variety of influences that may have been made salient in a crisis.

2.3 *An ecological perspective*

A productive approach with extended cross-disciplinary applications, the ecological perspective has been adopted to capture the complexity of contextual influences on language learning (e.g., Heft, 2001; Kramsch, 2002, 2009; van Lier, 2000, 2004). Rather than focusing on the effort and style of individual learners, this approach foregrounds the various influences from the physical and emotional context that combine to modulate the learner's decisions and behaviours (Kramsch, 2009). Applying an ecological lens to the teaching practice, Tudor (2003) argued that the profession was characterised by its inherent complexity: "acknowledging and working openly with this complexity is fundamental to any honest attempt to understand language teaching as it really is" (Tudor, 2003, p. 2). Apart from teacher-student interaction, which has been at the centre of many empirical studies, research on language teaching needs also to address the complexity of teaching as it happens in a context that involves a host of different factors and influencers, including the personal factor, influences from political and educational authorities, institutional managers and administrators, sponsors, parents, and many others who exert a less direct influence on shaping the teaching practice (Tudor, 2003).

The current study adopted an ecological perspective for the purpose of capturing the unpredictability and complexity of crisis-prompted online teaching, the details concerning which remain insufficiently understood in the previous studies that resorted to quantitative measures. A finer-grained understanding can be obtained by adopting an ecological perspective, as it works to contextualize individuals' practices in multi-faceted surroundings and the intricate relationships involved in the occurrences and interactions in an educational setting (van Lier, 2004). In the pandemic situation, an ecological lens enables a close view of the contingent situation and the full wraparound lives of individual practitioners who served multiple roles during the COVID-19 quarantine. During the COVID-19 pandemic, as classes were moved online, drastic changes took place in the immediate context of teaching. Practitioners were expected to adapt to a new pedagogical ecology, with a number of changes brought by the shift from a face-to-face to a virtual environment. One prominent change was the change of the overall setting, since the crisis-prompted teaching, which virtually took place on internet-enabled platforms, physically took place in the home. Compared with the pre-pandemic teaching practice, teachers in quarantine were physically confined to the home setting, with the clear-cut boundaries between life and work diminished by the convergence of the domestic and professional spheres. This change further led to changes in the teacher's daily schedule and routine as the saved hours from commute could be spent attending to family and chores. By contrast, the school, which used to be the most immediate context to the teaching practice, was reduced to a secondary place to the more relevant domestic setting, with significant actors such as institutional managers and administrators exerting remote control and supervision over the practice and decision-making of individual teachers. Moreover, there could also be influence from the sociocultural environment since online education had been a popular topic in public discussion during the quarantine. On the other hand, personal factors such as age, gender, personality, resilience, adventurousness, and working experience could have worked as inner drivers for individual practitioners or, in some cases, might have discouraged them from negotiating their way through the online teaching experiment. By evaluating the ecological influences from diverse sources beyond the immediate classroom setting, the study aims to supply evidence for a refined understanding of how Chinese EFL teachers reacted to the mandate to move classes online and what factors may have played a part in shaping their adaptive teaching practices.

With this general aim, the study seeks to explore two specific questions:

(1) To what degree can the Chinese EFL teachers' teaching-from-home experiences during the first online semester be associated with improvisation?

(2) Beyond the virtual classroom, what ecological factors have influenced Chinese EFL teachers' improvisation efforts, and how?

3. Methods

Convenience sampling was adopted to recruit the most accessible EFL teachers who taught from home during the pandemic. With the help of several teachers known through networking, an invitation to the study was sent via email to the full-time teaching faculty at the English Department and the College English Department of the School of Foreign Languages and Literature in three universities (identified as University A, B, and C). These three universities are located in different cities in eastern coastal China. They are all comprehensive universities with similar national rankings. The inclusion of participants from different universities was meant to enrich findings on EFL teachers' practices, yet no endeavour was made to explore cross-university differences.

Data were collected via a questionnaire and in-depth e-interviews. Data collection took place during July and August 2020, the summer vacation right after the spring semester ended. This was meant to capture the participants' immediate reflections on their teaching-from-home practices during the initial closing of campuses, as remote teaching had been implemented nationwide during the spring semester of 2020 (Ministry of Education, 2020). By the end of September 2020, i.e., one month into the autumn semester, the three schools had largely reopened their campuses.

For a preliminary look at EFL teachers' teaching-from-home experience during the quarantine, a questionnaire was sent via email to 128 EFL teachers in the three universities; among the recipients 58 responded (the response rate was 45.3%). The questionnaire was designed to elicit demographic data and background information concerning online teaching and training experience before and during the quarantine. In particular, questions were included that targeted individual teachers' preparedness and creativity in relation to the crisis-prompted online teaching experience. To gauge the intention and degree of their improvisation efforts, respondents were asked about their pre-quarantine experience of teaching and training, as well as knowledge and practice in distance education. They were also asked to recall their attempts to adapt to the new mode of teaching, including their experimental endeavours and intention to try new things. The questionnaire concluded with an overall self-assessment, where respondents rated their online teaching performance with a numerical scoring for preparedness and creativity, respectively. A questionnaire draft was created and piloted on ten teachers whose feedback and comments were then taken into account to improve the questions prior to distributing the modified version of the questionnaire.

Twenty-four teachers were selected from the questionnaire respondents for in-depth interviews to explore the improvisation efforts of individual practitioners. For each university, eight teachers were chosen who reported online teaching experience during the quarantine. An effort was made to balance the age, gender, and overall teaching experience among the chosen participants. A semi-structured format (Cohen et al., 2000, p. 270) was followed in designing the interview protocol to allow emergent topics of interest to be further pursued.

The interviews were conducted by using the web-based conferencing tool Tencent Meeting or by video chat using instant communication apps (i.e., WeChat, Tencent QQ). Altogether, six interviews were conducted with the 24 teacher participants, including three group interviews and three separately with the researcher. To mitigate the effect of a possible university and an age bias, care was taken in grouping the participants to ensure each group had teachers from all three universities and of different age ranges. Though the gender imbalance was inherent to the participant pool (8 male, 16 female), care was taken to include both male and female teacher participants in each group interview. The interviews were held with groups and individuals at the pre-scheduled date and time. All the interviews were conducted in Chinese, with occasional codeswitching into English initiated only by the participant. The interviews lasted approximately 60 minutes for each group interview and 20 minutes for each with the individual and were recorded with the participants' permission.

The questionnaire results were calculated using the Excel software, and the demographical information was sorted by categories. The interview recordings were transcribed verbatim and double-checked before being subject to thematic analysis aided by NVivo 11.0. Based on a close reading of the transcriptions and information gathered by the questionnaire, a coding scheme was developed to tease out institutional, daily contextual, sociocultural, and personal sources of ecological influence individual participants were subject to. Two trained researchers were invited to first independently code the interview data of four randomly selected participants to establish inter-rater reliability ($k = 0.83$). Afterwards, the remaining transcriptions were divided in half, with each half being separately coded by one of the researchers. Inter-rater agreement was also calculated at the end of the coding procedure on a common sample of 10% of the transcriptions ($k = 0.87$). Any disagreement that arose was discussed until a consensus was reached.

4. Findings

This section reports the major research findings. The first research question, which assesses the EFL teachers' improvisation attempts during their teaching-from-home experiences, will be addressed in 4.1. The questionnaire answers, in combination with the interview data, help present an overall picture of the participants' readiness and creative endeavour for adapting to the new pedagogical ecology. The second research question, targeting the ecology of the participants' emergency remote teaching, will be explored in 4.2, where the results of the thematic analysis are presented. The findings presented in this section are illustrated with representative interview extracts taken from the answers and comments given by the pseudonymised teachers. The extracts were originally in Chinese and were translated into English by the researcher; the English translations were checked and confirmed by the quoted participants. To avoid the intended message being lost or twisted in translation, in-vivo coded expressions were used where the original Chinese wording was deemed more accurate and expressive than its English translation. These findings will be discussed with reference to recent empirical findings as well as against pre-pandemic research on improvisation in teaching.

4.1 *Improvisation in teaching-from-home practice*

In general, 58 participants associated their teaching-from-home experiences with a degree of preparedness that was slightly below the mid-point (average self-rating of 2.2 out of 5) and a degree of creativity that was slightly above the mid-point (average self-rating of 2.8 out of 5). In terms of unpreparedness, the majority of the teachers reported having no online teaching experience and not much knowledge about how to teach online. Regarding creativity, fewer than half of the teachers reported having tried new things, yet over half expressed their willingness to try something new (see Table 1).

Table 1. Self-rated improvisation efforts during COVID-19 emergency teaching among a sample of Chinese EFL teachers

Dimension of efforts	none	a little	some	a lot	not sure
online teaching experience	42	12	2	0	2
online teaching know-how	5	28	25	0	0
tried new things	31	12	8	2	5
willingness to try new things	0	37	15	6	0

Judging from their self-rating, the EFL teachers were generally unfamiliar with online teaching and were underprepared for their new role as distance instructors. Their reactions to the mandate to "immediately go remote" (Westwick & Morreale, 2021, p. 217) were diverse and intense, which seemed to have affected individuals both mentally and physically. Participants recalled a range of symptoms of what they described as the "going-online shock", including anxiety, stress, panic, fear, insomnia, disrupted sleep or eating patterns. Making efforts to break the old routine and adapt to a new reality on short notice could be particularly stressful for teachers who had limited distance teaching experience and had to learn the minimally required skills from scratch (Hadar et al., 2020). This stress did not seem to have been mitigated by one's teaching experience in the "brick-and-mortar" classroom: participants reported an average of 8.3 years of teaching experience, with several highly experienced individuals with over 20 years of experience. One contributing factor to their shared unreadiness was a lack of proper training and the knowledge and skills needed to teach online. Less than 20% of the teachers had memories of receiving training for remote teaching, often in the form of intensive lectures or workshops that lasted less than one week. None reported having received systematic training that involved hands-on practice. Comparatively speaking, the teachers in the current study reported lower e-readiness than the participants in Zou et al. (2021), probably due to sample differences. This divergence also indicates the diverse backgrounds, histories, and memories individual practitioners drew from in making their personal responses to the

crisis-induced changes.

This preliminary survey finding was later confirmed and extended in the interviews, where participants' descriptions of their pre-pandemic teaching experiences revealed that they generally lacked proper training for distance teaching and had been challenged to "try it for the first time". Five out of the 24 participants recalled training experience in intensive sessions, yet they confessed not trying out the idea afterwards due to a lack of opportunities or motivation. Such training was almost symbolic and reduced online teaching to what one participant called "zhi shang tan bing" ('to discuss military matters on paper', to remain valid only in theory). Comparable findings on language educators' lack of remote teaching experience have been reported in several studies on COVID-prompted online teaching (e.g., Moser et al., 2021; Nguyen et al., 2022), indicating that concrete efforts are necessary to make meaningful changes towards digitalisation of education and professionalisation of faculty in an era of uncertainty.

Apart from being short on technological literacy, unpreparedness also meant that participants needed to work out ways to enable virtual learning with disabled access to resources (e.g., textbook unavailability caused by disrupted delivery services, restricted access to e-learning resources due to infrastructural insufficiency). Consequently, most teachers had to make do with what happened to be available at the time of the quarantine. As one participant explained:

I had no preparation [for the online teaching]. I doubted if anyone was prepared [for it]. It was too sudden to prepare for anything at all. I feel 'lucky' to have experienced this [unprecedented crisis], which will probably be written into history textbooks for future generations to study. [laughed half-jokingly] […] With limited resources and experience, I could only throw together what I had at hand. (Bing, University A)

Overall, the teacher participants reported having been unprepared professionally and psychologically for the crisis-prompted online teaching as they generally lacked the knowledge and training needed for a swift transition to distance education and thus felt stressed by the daunting task. This stress could have been heightened by resource shortages and access difficulties in the early stage of the pandemic. Moreover, a sense of 'collective' unpreparedness in a public health crisis may have influenced practitioners' perceptions of and reactions to emergency remote teaching. Whether and how the recognition of 'we are in this together' affected individual practitioners remains to be explored; the participant's response above hinted at a complicated mixture of feelings (e.g., helplessness, solidarity, self-mockery).

In comparison with the consistent results on preparedness or lack thereof, the survey results on creativity were more complex and interesting. On the one hand, the teachers seemed to be rather modest in crediting their creative attempts and efforts made during the teaching-from-home period, as less than half of respondents reported having tried new things in the crisis-prompted online teaching. On the other hand, they expressed only a lukewarm willingness to try new things. The top three areas where creative efforts were made or intended were technical tools, teaching materials, and in-class activity design. This result tends to violate the established feature of improvisation as a creative act. Several reasons may have contributed to this lack of willingness. First, in a pandemic situation, the disruption in the macro sphere may overwhelm individuals and deter their innovative attempts in the micro sphere. Thus, teachers' efforts may prioritise decisions and actions towards addressing critical and immediate concerns such as health and security. Second, since the disruption in the crisis context is abrupt and destructive, there is a lack of support for innovative attempts, which may bruise individuals' intention to try new things. Apart from physical limitations and constraints, there also seems to be a psychological barrier against individuals' creative endeavours. That is, rather than inspired or willed attempts, the teachers' improvisational efforts featured what might be considered 'forced' creativity, as one teacher explained:

[Before the pandemic,] my classes would follow a certain flow. […] when the pandemic caught me utterly unprepared, I had no idea what to do, and for a time, I thought I had lost control over the class, which was a horrible thought. But I knew I had to pull things off. […] If something I tried could be thought of as creative, then it was perhaps not due to my creativity in the first place. That is, I was made creative by the situation. I think it is one typical scenario of "*ji zhong sheng zhi*" ('creativity comes from desperation'). (Yao, University B)

Yao's ambivalent perception of the notion of creativity was shared by a number of participants, who chose not to

credit their responsive attempts as innovative endeavours by "trying new things". Instead, they preferred to see their efforts as trying something "different" rather than "new" or "creative", a view that was typically held among senior teachers and/or teachers who expressed a preference for traditional teaching styles and methods. An explanation was suggested in Wen's answer below when asked about his low self-rating on the "tried new things" question and the creativity scale.

> I am not sure whether it would count as creativity or not. But the good thing to know is that at least I challenged myself to do it. I would probably never have had the chance and the courage to try online teaching but for the pandemic. [laughed self-mockingly] An old-fashioned teacher as I was, what I considered 'creative' might be quite ordinary to others. (Wen, University C)

Taken as a whole, the evidence revealed an indecisive attitude towards creativity among the Chinese EFL teachers. Rather than a willed attempt at "discovering by trial, error and testing" (Heathcote, 1967, p. 27), their improvisational practices during the emergency online teaching tended to be passive and responsive in nature and subject to the macro-level influences and constraints. Nevertheless, this result needs to be read with caution. Although the participants rated their creativity at a medium level, and only some of them reported creative efforts being realised, the result does not exclude the possibility that they were inspired somewhat by the experience. The routine-shattering radical change brought by the pandemic may help develop a creative mindset in individuals and can be seen as an innovation in its own right (Ellis et al., 2020).

4.2 *Ecological influences on improvisation efforts*

To some extent, the Chinese EFL teachers' teaching-from-home experiences can be associated with improvisation that featured shared unpreparedness and ambivalent intention to experiment with new techniques, materials, and methods in crisis-prompted online teaching. To unpack the complex influences on the teachers' improvisational efforts, a closer analysis is made of the interview data. Findings are grouped into themes that emerged regarding the four sources of ecological influence, i.e., institutional, daily contextual, sociocultural, and personal factors.

4.2.1 *Institutional support as a double-edged sword*

Featuring prominently in the participants' responses was the influence of the institution. All participants mentioned the institutional influence in their accounts of the online teaching experiences, yet with a mixture of emotions. While most expressed their gratitude for the timely support given by the university, they also complained about the insufficiency and/or inadequacy of the support as well as the way the support had been given. The following extract from Jing, a senior teacher who had rich experience teaching in-person classes yet had never tried online teaching for a real class before the pandemic, was illustrative of this mixed feeling:

> I had no experience at all and couldn't have imagined myself doing it without the support from the school. They gave us very detailed instructions on how to use everything. You can follow them and learn by yourself. The instructions were very clear and easy to follow, much better than the information you found on the Internet, which was often very confusing. (Jing, University A)

As Jing explained, the task of moving classes online 'overnight' may have seemed daunting to practitioners with limited knowledge and experience of distance teaching, giving rise to disbelief and anxiety (Westwick & Morreale, 2021). The institutional support rendered to faculty mainly focused on solving technical problems in online teaching and was favourably described by participants as "careful", "detailed", and "beginner-friendly". Nonetheless, they also complained about the practical issues which could have been addressed more efficiently, as Jing recalled a specific example:

> They invited us to a chat group on WeChat for technical troubleshooting, which was designed to help solve problems for individual teachers. However, as there was only one technical expert in the group of over 100

teachers waiting for solutions, you could not expect to get a timely response, if ever there was one. We obviously couldn't blame the technicians, who were overworked during that time. But things could work more efficiently if they had come up with a better plan. (Jing, University A)

In comparison with the focus on rendering technical support, there was far less mention of assistance given for non-technical aspects of teaching (e.g., teaching materials, course design, class activities, course assessment) which were nonetheless central to the effectiveness of the online course. In the crisis context, however, the normal structure of teaching was disrupted, and many teachers were forced to make changes to materials and activities that had been used routinely for their courses (Celik et al., 2022). For instance, shortly before the spring semester started, Ying was asked to replace the regular textbook for her listening course because her students could not get the textbook in time due to suspended courier service during the pandemic, and she was not allowed to use or share the electronic version of the textbook due to copyright concerns.

I was really "*zhua kuang*" ('freaking out') at that time. It was less than a week [before the semester started] when I was told that I could not use the old textbook. How on earth can I find an alternative in such a short time? […] After reviewing some materials I had been using for some other courses, I found them inappropriate, and I decided to make the courseware from scratch. It was a real challenge as I had very little time to prepare the class, and I had to prepare for a new session after each class. It was a real experiment without a pre-test. (Ying, University C)

Ying was not alone in having to experiment with improvised teaching materials. Over two-thirds of the participants mentioned having had to make substantial changes to their teaching materials to adapt to the online course, though not all of these teachers counted such adaptation as a creative endeavour. Others preferred the materials from previous courses or readymade materials downloaded from the internet or electronic textbooks provided by the publisher. Like Ying, all the participants who had to improvise with the materials they had at hand survived the challenge by "piecing together bits and pieces", "reusing old stuff", or "turning to the internet for help". Nonetheless, they shared doubts about the effectiveness of the temporary materials due to the lack of effort and time put into creating them. As Casey and McAlpine note, "anyone who has had to create learning materials from scratch knows just how labour intensive and time consuming the process can be" (Vercoustre & McLean, 2005, p. 57). The teachers' struggle with lesson preparation was echoed by the participants in a previous study (Zou et al., 2021), who perceived "more time and energy are demanded to prepare for lessons" (p. 7) as the second-largest problem in online teaching during the pandemic.

Among the participants, there was also a shared regret towards their improvisational decisions hindered by the institutional constraints, as some school-based regulations on online teaching during the crisis were found to be rigid or crippling, as Peng, a middle-aged male teacher who considered himself a "*jishu daren*" ('technical guru') complained:

As I have a personal interest in studying online teaching technology, I know some other tools and platforms which would work much better than the Rain Classroom. Yet, the school asked us to stick to the Rain Classroom, and no alternatives were allowed. Unless you would dare to run the risk of getting a "*jiaoxue shigu*" ('teaching accident') record in your file, you didn't have a very good chance to try out your creative ideas. (Peng, University B)

It was a shame that practitioners like Peng, who wanted to experiment with creative ideas in the virtual classroom, had been crippled by the less flexible school policy. A fair number of the participants explained that the university had "recommended" using specific platforms or tools for online teaching and had explicitly discouraged alternatives proposed to facilitate a smooth class. Although inadequate technological literacy was identified as a "*tong dian*" ('a vital weakness') the participants had mainly been suffering from, they expressed varying degrees of willingness to try out the new technology rather than clinging to the old approach.

4.2.2 *The pain and gain of teaching from sweet home*

The teacher's teaching-from-home experience was also found to be subject to the influence of daily contextual factors, which, during the quarantine, mainly revolved around the home. Although most participants had anticipated greater comfort and ease of teaching from home, they soon found that the changes that accompanied this new way of teaching were not all that pleasant or desired. Ting, a young mother of two, had dreamt about working from home prior to the pandemic because she thought that moving classes from school to home would allow her the convenience of attending to her young children. However, she began to have second thoughts as the comfort of staying at home did not last long before the misery visited.

> I found it did not go as I thought it would. Because the elder one could not go to kindergarten, and the younger one was not yet of age, they were staying in every day, turning the house upside down. They were told to behave themselves, but they were only kids, and you could not yell at them when they came into the room where you were teaching on camera. […] I wanted to try something new with the students - activities that would work better in an online classroom - but I often got distracted by other things and couldn't focus. (Ting, University A)

Ting was typical of female teachers who juggled work and family and had been longing for the convenience of working from home. However, as the immediate context of work and family became one - the most evident contextual change in the crisis-prompted online teaching - both would be influenced by the possible interaction and interference between the two spheres. The result was sometimes an overstressed working parent who found it more difficult to concentrate on the job than if working away from home. As a cognitively demanding activity, improvisation requires a high level of concentration. Thus, any distraction or interruption during the process would likely reduce the effectiveness of the practice. The key to keeping online teaching going well - as joked by another mother of two - was to keep the "*shen shou*" ('little beasts', noisy kids) at bay.

However, changes in the physical context of teaching did not lead to disturbance in all cases. Some participants seemed to have benefited from working with family members who were also forced to shift to working or learning from home. Xin, who had been discouraged by technical problems with interacting with his students due to limitations of the prescribed platform, was instead inspired by his 10-year-old daughter, who had been taking online classes via DingTalk, an online teaching tool popularly used by primary and secondary school teachers in China during the quarantine.

> I had been conducting my courses on the recommended platform, yet I found it not very handy in classroom interaction. The students could only watch me talking on camera and give feedback by sending me messages. I was teaching two interpreting classes, and asking the students to write out their answers to an interpreting exercise would turn the practice into a translation exercise. […] I tried DingTalk, which worked better with spontaneous answers and the tool also recorded the class automatically so that students could replay it afterwards for review, a function that was also missing in the platform. (Xin, University B)

Apart from inspiration from children, support from one's spouse also played a meaningful part. Several female participants who described themselves as being "*jishu xiaobai*" ('technical dummy') sought help from their loved ones who "knew the technical stuff better", "had experience conducting online meetings", "found it was like child's play", or "understood the instructions more quickly". Though this evidence did not necessarily indicate a gender difference in technological literacy, it was evident that family support as a crucial daily contextual factor may contribute to the improvisational online teaching practice, as Ping and Jun, a couple who taught different subjects in the same university, shared their experience of working together from home:

> Since we were both teaching from home, we could help each other out whenever there was an emergency. I could run into a technical problem at any time and not know what to do, and he would come to my rescue if he was not teaching at the time. He often knew better about how to deal with emergencies, and he often said to me, "When you find yourself in a crisis, it's time to be creative". (Ping, University C)

Teacher couples like Ping and Jun worked in collaboration during the quarantine to sustain and improve online teaching by encouraging and helping each other. As the pandemic spread, online emergency teaching toolkits (e.g., Brooks et al., 2020) were developed and shared by teachers from various disciplines. Seeking collaboration beyond the disciplinary boundary was proposed as a meaningful attempt to combat the situation faced by all teachers and professionals. Learning from experienced colleagues aside, EFL teachers might also expect to gain insights from teachers in other academic disciplines or even in other fields of work, as Long, who had been experimenting with ways to engage his students in a business English course taught online, improvised a new method of organising classroom discussion after talking with his wife who worked in a company.

> I found that the activities I used to organise in the traditional classroom did not work well in the virtual one. You need a real classroom for things like classroom discussion to work. Lan [Long's wife] worked in the business, and she often conducted interviews with job hunters online. When I mentioned this problem to her, she suggested that I try the group interview method. I got inspired and came up with a creative way to engage the students in the discussion. (Long, University A)

In general, the daily contextual influence on the EFL teachers offered a bittersweet experience. Female participants constituted two-thirds of the sample, and over half of them had married with children. As teaching from home became the daily norm, their roles in the family as housekeepers and caretakers were made more pertinent than when they worked on campus. While the consequent closeness to family members may have caused disturbances and deflated efforts to spend extra time on teaching, it served as an important source of inspiration and assistance.

4.2.3 *A live-streaming star dream come true*

Apart from institutional and daily contextual influences, it was found that sociocultural factors could also affect teachers' online teaching performance in a less direct way. More than half of the participants mentioned the cultural meme of "*zhubo laoshi*" ('teacher as live-streamer'), which was described as "harmless", "light-hearted", "humorous", "trendy", "viral", or "realistic". Dong, who identified himself as a long-time supporter of online teaching, shared his dream of being a "live-streaming star teacher":

> When I was doing my degree overseas, I realised many things could be done online, like seminars, tutoring, workshop, and many others. We could enjoy the benefit of high-tech products better if we could be less rigid and more creative. COVID-19 was such a time for changes to happen, and it was, as the popular saying goes, "time for teachers to become 'live-streamers'": "*buxiang dang zhubo de laoshi bushi hao laoshi*" ('a teacher who does not want to be a live-streamer is not a good one'). I liked the saying, and it was like my dream come true. (Dong, University B)

Dong was one of the few participants who expressed an explicit willingness to follow the trend and make online teaching a desired career. Most seemed to have been encouraged by the mass media to teach online, though some may have dismissed or diminished the idea previously. Chang, an experienced teacher in his early 50s, used to believe that online teaching was meant for younger teachers.

> I was not emotionally ready to teach online. I thought the new stuff was designed for the younger teachers, obviously not for someone in my age. Then when I read my WeChat feeds and I saw "*zhubo*" ('live streamer') teachers of all ages and backgrounds showing their skills, I began to have second thoughts. Perhaps I should follow the trend and give it a try. So I moved classes online, and I even bought myself a microphone, which, to me, would probably count as a creative act [laugh]. (Chang, University C)

Senior teachers like Chang might have struggled more than their younger colleagues, as they were more likely to suffer from insufficient technological literacy and inertia or resistance towards change (Drake & Sherin, 2006; Hargreaves, 2005; Kao, 2020; Wang, 2010). Therefore, there could be a real challenge to motivate them to make the change. In this regard, subtle yet powerful influence from the sociocultural context might have helped as individuals

were susceptible to media messages about pandemic-related topics. As "*shang wangke*" ('taking online classes') became a trending topic in public discourse during the first online semester in China, it sparked discussions on mass media and inspired memes targeting traditional-turned-online classes as well as teachers and students involved in this massive transformation. A series of well-known quips built themselves around the "teacher-as-live-streamer" metaphor mentioned by Chang, e.g., "*bingdu ba laoshi bicheng le zhubo*" ('the virus has turned the teacher into a live streamer'), "*laoshi beipo yingye*" ('teacher forced to run a live-streaming business'), and "*shiba xian zhubo*", ('an 18th-tier live streamer', an amateurish, unknown one as in contrast to a 'first-tier' live-streaming star). Despite a somewhat vulgar tone, these catchphrases and sayings seemed to have offered an outlet for teachers' stress and feelings of tension and anxiety. Ling, who had been suffering from burnout with a schedule of an average of 18 teaching hours per week, found a way to release the pressure by posting her frantic work schedule on WeChat moments to which she added self-deprecating comments adapted from the popular sayings, e.g., "*shiba xian nv zhubo beipo yingye*", literally 'an 18th-tier female live streamer is forced to run her business'. When asked how the sociocultural context affected her teaching, she answered:

Though I did not fancy the phrases and sayings, it was good for the public to sympathise with us teachers who were really having a hard time adapting to the new way of teaching. [...] We find it a little easier with public understanding and support. Meanwhile, it motivated me to explore new skills and be more creative by following the inspiring models of "wanghong" ('internet celebrity') teachers. After watching their online classes, I would often have an impulse to give their tricks a try in my teaching. (Ling, University A)

The sociocultural influence gave unique inspiration and support to the EFL teachers as they tended to agree on the motivating and "*jieya*" (stress-relieving) potential of the public discourse built around crisis-prompted online teaching, in particular, the "live-streaming star" meme.

4.2.4 *Personal traits as a growing resource*

In addition to the largely predictable influence sources, a theme of personal traits suggested itself in the analysis. This personal factor was specified by participants variously as personality, thought patterns, behavioural styles, and emotional characteristics. Interestingly, the factor was brought up by participants almost all after they were asked to give an overall evaluation of the creativity of their online teaching performance. One possible reason for this unanimous choice was that the notion of creativity seemed to evoke an intuitive reading in terms of a personal characteristic, as participants would assume a correlation between innovative efforts in online teaching and their innate ability to be creative. Hong, who rated herself low on the creativity scale, explained:

I don't think I was very creative in teaching my courses, nor do I consider myself a creative person. Yet, I wish I could have been more creative. Some teachers came up with many new ideas and experimented with their innovative teaching methods during the quarantine. I wish I could try some of my ideas as I did have some creative ideas. I was not adventurous enough - another personality weakness. (Hong, University C)

Aside from the practical influences from institutional and daily contextual constraints, personal factor was identified as the major hindrance to the individual's "being creative". Moreover, although most participants declared that they had some "bright ideas" and wished to experiment with them, they generally found themselves lacking the motivation, confidence, and/or ability to do so. As Joubert (2011) noted, "Sometimes problem solutions or novel ideas may dawn upon you unexpectedly or casually, but work must then be made of them to turn thoughts or ideas into creative action" (Joubert, 2011, p. 19). More effort was required to turn teachers' improvisational thoughts into actions that would make a difference.

Another noteworthy finding was that some participants noticed changes in their personal traits, which they attributed to the online teaching experience. Tong, a self-identified introvert who dreaded teaching on camera, was one of these teachers.

Livestreaming was a big challenge for me, yet I had to challenge myself to do this because it was the only way

for things to work. I panicked a lot at the beginning, of course, feeling quite nervous. Yet gradually, I found myself getting used to it and started to try to communicate with the students more, and it did help improve my performance. After a semester's hard practice, I'm now comfortable with teaching on camera and would prefer to appear on camera when communicating with students online, even when it isn't requested. I think it has helped me grow from a camera-shy person to a teacher who is capable of conducting online courses with comfort and confidence. (Tong, University B)

Similar to Tong, who had overcome her fear and anxiety about adapting to the new ecology of teaching online, participants also mentioned growth in other aspects, including personality, mood management, self-discipline, and habits of thought. Xun, who identified himself as a "lazy and worn-out" teacher, thought of himself differently as a teacher after the online teaching experience.

Although I was passionate about teaching when I started this career, I found myself slowly losing interest. And after teaching the same courses for several rounds, I became a 'lazy' teacher, using and reusing the same materials in class. This sudden change brought about by the crisis rekindled my interest in the profession, and for the first time in many years, I renewed the teaching materials and made radical changes to the course design. This change in the environment rebooted my system of teaching and prompted me to be creative. (Xun, University C)

The "rebooting" experience Xun underwent was representative of experienced teachers whose interest in teaching had dwindled over the years from repeating the same rounds of courses. For them, the changes brought by the crisis-prompted online teaching were welcome and exciting since they could try something for a change. Apart from renewing the teaching materials and the course design, as Xun explained, some teachers claimed that they had studied online courses on how to conduct online teaching. They tended to value the emergency as a precious learning experience that jumpstarted their personal development as lifelong learners.

5. Discussion

This section discusses the research findings with reference to relatable results from previous studies. The discussion is arranged in two sub-sections, each drawing from the findings addressing one of the two research questions. In 5.1, the findings on the participants' improvisation efforts during their online teaching experiences are discussed with a focus on revamping the conceptualisation of the term. The updated understanding covers a wider spectrum of educational scenarios and refines its definition regarding the dimensions of unpreparedness and creativity. 5.2 discusses the ecological influences on the participants' improvisation efforts in the pandemic situation, which locates the sources of support and hindrance identified in the qualitative findings, including institutional, daily contextual, sociocultural, and personal factors and the possible interactions among these sources of influence.

5.1 Improvisation in an emergency teaching context

The participants' self-reported improvisation efforts, as illustrated in Section 4.1, can be compared with the endeavours reported in studies in diverse educational contexts. In Spain, Italy, and Ecuador, the use of open innovation measures was encouraged to deal with difficulties and to create opportunities to manage knowledge flow (Tejedor et al., 2021). Mixed results were reported in Poland, where e-learning innovations were revealed to be both enabling and crippling for learners (Stecuła & Wolniak, 2022). In South Africa, researchers found that innovation and technology worked as a panacea to confront the challenges during the pandemic-induced lockdown (Adu et al., 2022). Overall, innovative attempts have been reported across disciplines, ranging from journalism (Mayo-Cubero, 2021), marketing (Gala et al., 2022), management (Ratten, 2023), biochemistry (Pilkington & Hanif, 2021) to various subjects in medical sciences (Dedeilia et al., 2020; Dua et al., 2020; Owolabi & Bekele, 2021; Succar et al., 2022).

This array of studies propels us to reconsider the relationship between components of improvisation and the value of discussing the idea beyond the pandemic situation. A study based on Indonesian teachers' performance during the

pandemic revealed the positive effect of hard skills, soft skills, and organisational learning on teachers' innovation capacity (Novitasari et al., 2020). In a similar vein, research drawing from teachers' responses in Jakarta identified transactional leadership and learning organization as contributing factors to teachers' innovation ability (Supriadi et al., 2020). We may therefore surmise that innovation worked in combination with other individual qualities that were evoked in the emergency teaching context and may exert a lasting influence on teachers' performances (Ellis et al., 2020).

The distinctive features of improvisation in a crisis context extend our understanding of the term to include emergency-induced improvisation as responsive activities with shared unpreparedness and opportunities to innovate. In this sense, we may reconsider improvisation by placing it on a continuum of unpreparedness intersected by a continuum of creativity. At the lower unpreparedness end, improvisation is a disciplined skill honed through training; towards the higher unpreparedness end, it is a responsive action situated in a crisis context. On the creativity scale, the lower end features a makeshift solution by making or fabricating "out of what is conveniently on hand" (Merriam-Webster, n.d.), whereas the higher end features an extemporaneous composition that is ingeniously inspired. Hence, an inclusive definition of the fluid term "creativity" was proposed to describe the Chinese EFL teachers' endeavours to adapt to the pandemic-prompted online teaching despite a lack of knowledge, training, experience, and resources. In light of this renewed understanding, the study intends to convey the value of less structured, more individualistic efforts teachers make in response to radical changes. For their efforts to be fully recognised and further encouraged, institutions need to base their policies and decisions on a sound understanding of teachers' perceptions and experiences so as to lend the right support and avoid inhibiting their innovative attempts. It is also pertinent for the government and other key players to help create and sustain positive public perceptions and attitudes towards teaching and teachers in general and emergency online teaching in particular. Moreover, practitioners may benefit from reviewing and sharing their emergency online teaching experiences to learn from and inspire each other.

5.2 *Ecological sources of support and hindrance to improvisation in the pandemic scenario*

As showcased in Section 4.2, institutional influence acted as a double-edged sword for the EFL teachers. The technical support offered by the universities was meant for emergency online teaching in general, yet without much consideration of discipline-specific needs. In an EFL class, teachers would often resort to diverse modes of delivery and multiple sources of input to engage students. This requires technical assistance customised for language classes (e.g., high-quality audio delivery service for listening and interpreting exercises). As revealed in the study, institutions' 'one-size-fits-all' approach and inflexible measures did a disservice to practitioners who might otherwise see their ideas pan out.

Technology-facilitated instruction in the pandemic situation has engendered much discussion (e.g., Aguayo et al., 2022; Bortoló et al., 2023; Cui et al., 2023), with mixed findings on individuals' innovative efforts to adapt to the digital learning environment. In this regard, the current study found a noticeable difference in knowledge, skills and attitudes across generations of teachers, which were examined in a number of studies (e.g., Billett et al., 2023; Doz et al., 2023). Dissimilar to the previous finding of age not being a significant variant in teachers' digital competence (Diz-Otero et al., 2023), the current study revealed practitioners' complex attitudes and feelings towards technology, typically with senior teachers. Several senior teacher participants mentioned that they had been benefiting from the advancing technology in many aspects of life and had acquired some knowledge and skills by using high-tech devices such as smartphones and tablets. Nonetheless, they remained suspicious about online teaching and did not believe that it ought to be replaced by traditional teaching. The younger teachers, by comparison, tended to be more technology savvy and less resistant to trying new modes and methods of training. Yet, working with the imposed constraints, they felt insufficiently supported to experiment with their ideas to make online teaching livelier and more effective.

Previous research has associated practitioners' favourable attitudes towards learning new technology with perceived usefulness (Sun, 2022). Success cases have been reported that initiated novel designs of technologically empowered online classes for effective foreign language teaching (Zubkov, 2022). In the current study, however, the teachers' ambivalent attitudes suggest that they acknowledged the role of technology in crisis-prompted online teaching. Yet, they were uncertain whether they would take the initiative to improve technology literacy without the impetus provided by the crisis.

With the advancing digitalisation trend and internet technology, language teaching is one area that has witnessed

transformational changes (Gee & Hayes, 2011). Innovative attempts have been active to diversify resources and channels for remote learning opportunities, giving rise to the non-traditional delivery of teaching via platforms such as Douyin (the Chinese TikTok) (Jiang, 2022). Though practitioners' efforts may have been hindered in the pandemic situation, the overall favourable sociocultural context could have exerted a long-term impact on practitioners as they became more interested in alternative teaching methods and were more likely to make agentive efforts to wield multilingual and multimodal expertise in creating online teaching materials (Ho & Tai, 2021).

Apart from the support from the sociocultural context, teachers were found to turn to themselves as sources of inspiration and strength in dealing with the stressful quarantine periods, when individuals were found prone to loneliness and addictive coping behaviours (Karakose et al., 2022). An optimistic view interprets the pandemic as a catalyst for change and innovation (Moorhouse & Wong, 2021). Since innovation has long been a highlighted concern in teacher training and development (Kennedy, 1987), incentives need to be created for teachers to critically review their practices and to initiate changes based on a thorough understanding of the ongoing changing ecology of teaching and learning (Gacs et al., 2020). Initial research efforts have been made to shed light on the "boundary-crossing process" (Yan & Wang, 2022) that individual EFL teachers went through while coping with the pandemic-induced changes. Nonetheless, whether and to what extent a personal factor could have influenced practitioners' coping strategies and performance awaits further exploration.

6. Conclusion

As a summary of the preliminary findings of this exploratory study, we may conclude that a mixture of institutional, daily contextual, sociocultural, and personal factors worked in complex ways to shape individual teachers' decisions and actions as they improvised their way towards adaptation to the new ecology of teaching online. Taken together, these findings point to the complex ecological influences on change-adapting behaviours among individuals and inspire further research into these behaviours in the COVID-19 context and beyond.

Due to the practical constraints on data collection during the pandemic, the current study has several limitations. First, the analysis was based on a small sample conveniently selected. The selection of participants and their willingness to participate might introduce bias since teachers who had a more positive experience or who were more open and comfortable with sharing their experience were likely to be over-represented. As such, the findings were more anecdotal than representative for any group of individuals. Second, the current study focuses exclusively on teachers, with no triangulation from other stakeholders such as students, parents, and administrators. Including evidence from other parties might have provided a more comprehensive and convincing view of the situation. In addition, despite its ecological perspective, the study captured a mere snapshot of the individuals' practices. For a fuller ecological account, a longitudinal study is needed to track the same group of teachers over time, which might offer deeper insights into the changes within individual teachers' adaptation process and how temporary or lasting these changes are.

With data gathered from larger and more diverse samples and analyses conducted in quantitative paradigms, we may expect to make a more robust and comprehensive evaluation of the level and strength of ecological influences on emergency online teaching across contexts. In particular, studies can be designed to refine the preliminary findings on patterns of influence and compare influences from different sources. In the current study, the institutional and daily contextual factors, which constitute the meso-level influences, appear to have exerted a direct and strong influence on the practitioners' improvisation efforts. In comparison, the macro-level sociocultural factors and the micro-level personal factors seem to have influenced the practitioners in a more subtle yet profound way. Further research is needed to explore how influences from various sources combine to shape decisions and behaviours in individuals so as to reveal the complex interactions between ecological influences and improvisational practices.

During the COVID-19 school closures, teachers around the world were challenged to adapt to the new ecology of distance education on unprecedently short notice. For some, this adaptation had been a guided practice within the school's emergency plan; for some, it had been a motivational experience that opened up a world of possibilities; yet for some, the change turned out to be too expensive to materialize in a public health crisis. Nonetheless, for all, it has been a growing experience. Unpacking how practitioners survived the change and challenge can help us become more aware of what the crisis has done to us as well as what it has done for us. Apart from enhancing 21st-century skills, it will impart to us the wisdom of growth to be put into everyday experiences in and beyond the pandemic. All in all, it has compelled

us to become skilled improvisers who learn to act responsively and responsibly in a crisis - whether one that occurs in a classroom or one that threatens humanity.

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References

Adu, K. O., Badaru, K. A., Duku, N., & Adu, E. O. (2022). Innovation and technology: A panacea to teaching and learning challenges during the COVID-19 lockdown in South Africa. *Research in Social Sciences and Technology, 7*(1), 69-89.

Aguayo, J. M. B., Valdes, J. H., Cordoba, V. H. M., Nájera, M. J., Vázquez, F. R. S., Muñoz, E. M., & Lirios, C. G. (2022). Digital activism in students of a university in central Mexico in the COVID-19 era. *Advances in Mobile Learning Educational Research, 2*(1), 297-307.

Ben-Horin, O. (2016). Towards a professionalisation of pedagogical improvisation in teacher education. *Cogent Education, 3*(1), 1248186.

Bennett, S., Priest, A.-M., & Macpherson, C. (1999). Learning about online learning: An approach to staff development for university teachers. *Australian Journal of Educational Technology, 15*(3), 207-221.

Berk, R. A., & Trieber, R. H. (2009). Whose classroom is it, anyway? Improvisation as a teaching tool. *Journal on Excellence in College Teaching, 20*, 29-60.

Billett, P., Turner, K., & Li, X. (2023). Australian teacher stress, well-being, self-efficacy, and safety during the COVID-19 pandemic. *Psychology in the Schools, 60*(5), 1394-1414.

Bond, M., Bedenlier, S., Marín, V. I., & Händel, M. (2021). Emergency remote teaching in higher education: Mapping the first global online semester. *International Journal of Educational Technology in Higher Education, 18*(1), 1-24.

Borko, H., & Livingston, C. (1989). Cognition and improvisation: Differences in mathematics instruction by expert and novice teachers. *American Educational Research Journal, 26*(4), 473-498.

Bortoló, G. M., Valdés, J. Á., & Nicolas-Sans, R. (2023). Sustainable, technological, and innovative challenges post Covid-19 in health, economy, and education sectors. *Technological Forecasting and Social Change, 190*, 122424.

Brooks, C., Mosier, B., & Bassett, M. (2020). Teaching from home? Now what? Preparing your online emergency teaching toolkit. *Journal of Physical Education, Recreation & Dance, 91*(6), 46-49.

Celik, B., Yildiz, Y., & Bilgin, R. (2022). The views of instructors in foreign language teaching with distance education model during the COVID 19 pandemic process: A study at Tishk International University in Erbil, Iraq. *International Journal of Social Sciences & Educational Studies, 9*(1), 148-176.

Cheung, A. (2021). Language teaching during a pandemic: A case study of zoom use by a secondary ESL teacher in Hong Kong. *RELC Journal*. https://doi.org/10.1177/0033688220981784

Cohen, M., Manion, L., & Morrison, K. (2000). *Research Methods in Education* (5th ed.). London: Routledge.

Cox, R. H., Dickson, D., & Marier, P. (2021). Resistance, innovation, and improvisation: comparing the responses of

nursing home workers to the COVID-19 pandemic in Canada and the United States. *Journal of Comparative Policy Analysis: Research and Practice, 23*(1), 41-50.

Coyne, C., Ballard, J. D., & Blader, I. J. (2020). Recommendations for future university pandemic responses: What the first COVID-19 shutdown taught us. *PLoS Biology, 18*(8), e3000889.

Cui, Y., Ma, Z., Wang, L., Yang, A., Liu, Q., Kong, S., & Wang, H. (2023). A survey on big data-enabled innovative online education systems during the COVID-19 pandemic. *Journal of Innovation & Knowledge, 8*(1), 100295.

Cutri, R. M., & Mena, J. (2020). A critical reconceptualisation of faculty readiness for online teaching. *Distance Education, 41*(3), 361-380.

Darling-Hammond, L. (2006). Constructing 21st-century teacher education. *Journal of Teacher Education, 57*(3), 300-314.

Dedeilia, A., Sotiropoulos, M. G., Hanrahan, J. G., Janga, D., Dedeilias, P., & Sideris, M. (2020). Medical and surgical education challenges and innovations in the COVID-19 era: A systematic review. *In Vivo, 34*(3 suppl), 1603-1611.

Demuyakor, J. (2020). Coronavirus (COVID-19) and online learning in higher institutions of education: A survey of the perceptions of Ghanaian international students in China. *Online Journal of Communication and Media Technologies, 10*(3), e202018.

Diz-Otero, M., Portela-Pino, I., Domínguez-Lloria, S., & Pino-Juste, M. (2023). Digital competence in secondary education teachers during the COVID-19-derived pandemic: Comparative analysis. *Education+ Training, 65*(2), 181-192.

Doz, E., Cuder, A., Caputi, M., Pellizzoni, S., & Passolunghi, M. C. (2023). Distance learning environment: Perspective of Italian primary and secondary teachers during COVID-19 pandemic. *Learning Environments Research, 26*(2), 555-571.

Drake, C., & Sherin, M. G. (2006). Practicing change: Curriculum adaptation and teacher narrative in the context of mathematics education reform. *Curriculum Inquiry, 36*(2), 153-187.

Dua, A. B., Kilian, A., Grainger, R., Fantus, S. A., Wallace, Z. S., Buttgereit, F., & Jonas, B. L. (2020). Challenges, collaboration, and innovation in rheumatology education during the COVID-19 pandemic: Leveraging new ways to teach. *Clinical Rheumatology, 39*, 3535-3541.

Ellis, V., Steadman, S., & Mao, Q. (2020). 'Come to a screeching halt': Can change in teacher education during the COVID-19 pandemic be seen as innovation? *European Journal of Teacher Education, 43*(4), 559-572.

Ersin, P., Atay, D., & Mede, E. (2020). Boosting preservice teachers' Competence and online teaching readiness through E-Practicum during the COVID-19 Outbreak. *International Journal of TESOL Studies, 2*(2), 112-124.

Felepchuk, E., & Finley, B. (2021). Playing the changes: Improvisation, metaphor, and COVID-19. *Critical Studies in Improvisation, 14*(1), 1-13.

Ferlin, A., Malesic, M., & Vuga Bersnak, J. (2021). Preparedness vs. improvisation: A response to the COVID-19 crisis in Slovenia. *Teorija in Praksa, 58*, 632-651.

Gacs, A., Goertler, S., & Spasova, S. (2020). Planned online language education versus crisis-prompted online language teaching: Lessons for the future. *Foreign Language Annals, 53*(2), 380-392.

Gala, P., Woodroof, P., & Drehmer, C. (2022). Going the extra mile: Teaching innovations during Covid times. *Marketing Education Review, 32*(2), 181-184.

Gee, J. P., & Hayes, E. R. (2011). *Language and Learning in the Digital Age* (1st ed.). London: Routledge.

Graue, E., Whyte, K., & Delaney, K. K. (2014). Fostering culturally and developmentally responsive teaching through improvisational practice. *Journal of Early Childhood Teacher Education, 35*(4), 297-317.

Graue, E., Whyte, K., & Karabon, A. E. (2015). The power of improvisational teaching. *Teaching and Teacher Education, 48*, 13-21.

Guo, J., Zhu, R., Zhao, Q., Li, M., & Zhang, S. (2020). Adoption of the online platforms Rain Classroom and WeChat for teaching organic chemistry during COVID-19. *Journal of Chemical Education, 97*(9), 3246-3250.

Hadar, L. L., Ergas, O., Alpert, B., & Ariav, T. (2020). Rethinking teacher education in a VUCA world: student teachers' social-emotional competencies during the Covid-19 crisis. *European Journal of Teacher Education, 43*(4), 573-586.

Hargreaves, A. (2005). Educational change takes ages: Life, career and generational factors in teachers' emotional responses to educational change. *Teaching and Teacher Education, 21*(8), 967-983.

Heathcote, D. (1967). Improvisation. *English in Education, 1*(3), 27-30.

Heft, H. (2001). *Ecological Psychology in Context: James Gibson, Roger Barker, and the Legacy of William James's Radical Empiricism*. Mahwah, NJ: Lawrence Erlbaum.

Ho, W. Y. J., & Tai, K. W. H. (2020). Doing expertise multilingually and multimodally in online English teaching videos. *System, 94*, 102340. https://doi.org/10.1016/j.system.2020.102340

Hodges, C. B., Moore, S., Lockee, B. B., Trust, T., & Bond, M. A. (2020). *The difference between emergency remote teaching and online learning*. https://vtechworks.lib.vt.edu/bitstream/handle/10919/104648/facdev-article.pdf?sequence=1

Jiang, Y. (2022). Teaching English on Douyin: Language commodification and translanguaging. In S. Li (Ed.), *English in China: Creativity and Commodification* (1st ed.) (pp. 95-112). London: Routledge.

Joubert, M. M. (2001). The art of creative teaching: NACCCE and beyond. In A. Craft, B. Jeffrey, & M. Leibling (Eds.), *Creativity in Education* (pp. 17-34). London: Continuum.

Kao, Y. T. (2020). Understanding and addressing the challenges of teaching an online CLIL course: A teacher education study. *International Journal of Bilingual Education and Bilingualism*. https://doi.org/10.1080/13670050.2020.1713723

Karakose, T., Ozdemir, T. Y., Papadakis, S., Yirci, R., Ozkayran, S. E., & Polat, H. (2022). Investigating the relationships between COVID-19 quality of life, loneliness, happiness, and internet addiction among K-12 teachers and school administrators - a structural equation modeling approach. *International Journal of Environmental Research and Public Health, 19*(3), 1052.

Kennedy, C. (1987). Innovating for a change: Teacher development and innovation. *ELT Journal, 41*(3), 163-170.

Kramsch, C. (Ed.). (2002). *Language Acquisition and Language Socialisation: Ecological Perspectives*. New York, NY: Continuum.

Kramsch, C. (2009). *The Multilingual Subject*. New York, NY: Oxford University Press.

Lavik, E. (2021). Thermo in the Time of COVID-19: Using improvisation to foster discussion and translating the experience to online learning. *Biomedical Engineering Education, 1*(1), 133-138.

Lloyd, M. (2020). ASM Virtual EduCon 2020. *Microbiology Australia, 41*(3), 163-164.

Lobman, C. L. (2006). Improvisation: An analytic tool for examining teacher-child interactions in the early childhood classroom. *Early Childhood Research Quarterly, 21*(4), 455-470.

Maheux, J. F., & Lajoie, C. (2011). Improvisation in teaching and teacher education. *Complicity: An International Journal of Complexity and Education, 8*(2), 86-92.

Marek, M. W., Chew, C. S., & Wu, W. C. V. (2021). Teacher experiences in converting classes to distance learning in the COVID-19 pandemic. *International Journal of Distance Education Technologies, 19*(1), 89-109.

Mayo-Cubero, M. (2021). Teaching innovation experience for COVID-19 times: A case study on blended learning of television journalism courses with Moodle. *Asia Pacific Media Educator, 31*(2), 178-194.

Merriam-Webster. (n.d.). *Improvise*. In Merriam-Webster.com dictionary. https://www.merriam-webster.com/dictionary/improvise

McCollum, P. (1989). Turn-allocation in lessons with North American and Puerto Rican students: a comparative study. *Anthropology & Education Quarterly, 20*(2), 133-156.

Midha, G. (2021). Inhibited improvisation: School leadership during the COVID-19 crisis. *International Studies in Educational Administration, 49*(3), 27-60.

Ministry of Education. (2020). *MOE issues instructions for deployment of HEI online teaching*. http://en.moe.gov.cn/news/press_releases/202002/t20200208_419136.html

Montuori, A. (2003). The complexity of improvisation and the improvisation of complexity: Social science, art and creativity. *Human Relations, 56*(2), 237-255.

Moorhouse, B. L., & Wong, K. M. (2021). The COVID-19 Pandemic as a catalyst for teacher pedagogical and technological innovation and development: Teachers' perspectives. *Asia Pacific Journal of Education*. https://doi.org/10.1080/02188791.2021.1988511

Moser, K. M., Wei, T., & Brenner, D. (2021). Remote teaching during COVID-19: Implications from a national survey of language educators. *System, 97*, 102431.

Nguyen, N. H., Tran, T. L. N., Nguyen, L. T., Nguyen, T. A., & Nguyen, M. T. (2022). The interaction patterns of pandemic-initiated online teaching: How teachers adapted. *System, 105*, 102755.

Novitasari, D., Yuwono, T., Cahyono, Y., Asbari, M., Sajudin, M., Radita, F. R., & Asnaini, S. W. (2020). Effect of hard skills, soft skills, organizational learning and innovation capability on Indonesian teachers' performance during Covid-19 pandemic. *Solid State Technology, 63*(6), 2927-2952.

Owolabi, J., & Bekele, A. (2021). Implementation of innovative educational technologies in teaching of anatomy and basic medical sciences during the COVID-19 pandemic in a developing country: The COVID-19 silver lining? *Advances in Medical Education and Practice*, 619-625.

Philip, T. M. (2019). Principled improvisation to support novice teacher learning. *Teachers College Record, 121*(6), 1-32.

Pilkington, L. I., & Hanif, M. (2021). An account of strategies and innovations for teaching chemistry during the COVID-19 pandemic. *Biochemistry and Molecular Biology Education, 49*(3), 320-322.

Ratten, V. (2023). The post COVID-19 pandemic era: Changes in teaching and learning methods for management educators. *The International Journal of Management Education, 21*(2), 100777.

Supriadi, O., Musthan, Z., Sa'odah, Nurjehan, R., Haryanti, Y. D., Marwal, M. R., Purwanto, A., Mufid, A., Yulianto, R. A., Farhan, M., Fitri, A., Fahlevi, M., & Sumartiningsih, S. (2020). Did transformational, transactional leadership style and organizational learning influence innovation capabilities of school teachers during Covid-19 pandemic? *Systematic Reviews in Pharmacy, 11*(9), 299-311.

Quezada, R. L., Talbot, C., & Quezada-Parker, K. B. (2020). From bricks and mortar to remote teaching: a teacher education programme's response to COVID-19. *Journal of Education for Teaching, 46*(4), 472-483.

Rodić, M. V., & Rodić, D. D. (2020). Plans vs reality: Reflections on chemical crystallography online teaching during COVID-19. *Journal of Chemical Education, 97*(9), 3038-3041.

Sawyer, R. K. (2004). Creative teaching: Collaborative discussion as disciplined improvisation. *Educational Researcher, 33*(2), 12-20.

Sawyer, R. K. (2011). What makes good teachers great? The artful balance of structure and improvisation. In R. K. Sawyer (Ed.), *Structure and Improvisation in Creative Teaching* (pp. 1-24). Cambridge: Cambridge University Press.

Stecuła, K., & Wolniak, R. (2022). Advantages and disadvantages of e-learning innovations during COVID-19 pandemic in higher education in Poland. *Journal of Open Innovation: Technology, Market, and Complexity, 8*(3), 159.

Succar, T., Beaver, H. A., & Lee, A. G. (2022). Impact of COVID-19 pandemic on ophthalmology medical student teaching: Educational innovations, challenges, and future directions. *Survey of Ophthalmology, 67*(1), 217-225.

Sun, P. P. (2022). Understanding EFL university teachers' synchronous online teaching belief change. *Language Teaching Research*. https://doi.org/10.1177/13621688221093833

Tejedor, S., Cervi, L., Pérez-Escoda, A., Tusa, F., & Parola, A. (2021). Higher education response in the time of coronavirus: Perceptions of teachers and students, and open innovation. *Journal of Open Innovation: Technology, Market, and Complexity, 7*(1), 43.

Thomas, C. A., & Berry III, R. Q. (2019). A qualitative metasynthesis of culturally relevant pedagogy & culturally responsive teaching: Unpacking mathematics teaching practices. *Journal of Mathematics Education at Teachers College, 10*(1), 21-30.

Tudor, I. (2003). Learning to live with complexity: An ecological perspective on language teaching. *System, 31*(1), 1-12.

van Lier, L. (2000). From input to affordances: Social-interactive learning from an ecological perspective. In J. P. Lantolf (Ed.), *Sociocultural Theory and Second Language Learning* (pp. 245-259). Oxford, England: Oxford University Press.

van Lier, L. (2004). *The Ecology and Semiotics of Language Learning: A Sociocultural Perspective*. Boston, MA: Kluwer Academic.

Vercoustre, A. M., & McLean, A. (2005). Reusing educational material for teaching and learning: Current approaches and directions. *International Journal on E-learning, 4*(1), 57-68.

Wang, C., Cheng, Z., Yue, X. G., & McAleer, M. (2020). Risk management of COVID-19 by universities in China. *Journal of Risk and Financial Management, 13*(2), 36.

Wang, Q (2010). A study of the relationship between foreign language teachers' information literacy self-efficacy and their attitudes toward web-based teaching. *Journal of Northwest Normal University (Social Sciences), 5*, 96-102.

Westwick, J. N., & Morreale, S. P. (2021). Advancing an agenda for instructional preparedness: Lessons learned from the transition to remote learning. *Communication Education, 70*(2), 217-222.

Whalen, J. (2020). Should teachers be trained in emergency remote teaching? Lessons learned from the COVID-19 pandemic. *Journal of Technology and Teacher Education, 28*(2), 189-199.

Wiedner, R., Croft, C., & McGivern, G. (2020). Improvisation during a crisis: Hidden innovation in healthcare systems. *BMJ Leader*, 1-4. https://doi.org/10.1136/leader-2020-000259.

Wright, C. G. (2019). Constructing a collaborative critique-learning environment for exploring science through improvisational performance. *Urban Education, 54*(9), 1319-1348.

Xi, J. (2020). *President Xi Jinping extended festival congratulations and sincere wishes to teachers and educators across the country*. Xinhua News Agency.

Yan, C., & Wang, L. (2022). Experienced EFL teachers switching to online teaching: A case study from China. *System, 105*, 102717. https://doi.org/10.1016/j.system.2021.102717

Zondag, A. (2021). Student teachers' experience with improvisation activities for spontaneous speech practice in English. *Language Teaching Research*, 1-24. https://doi.org/10.1177/13621688211044725

Zou, B., Huang, L., Ma, W., & Qiu, Y. (2021). Evaluation of the effectiveness of EFL online teaching during the

COVID-19 pandemic. *SAGE Open, 11*(4). https://doi.org/10.1177/21582440211054491

Zou, C., Li, P., & Jin, L. (2021). Online college English education in Wuhan against the COVID-19 pandemic: Student and teacher readiness, challenges and implications. *PloS One, 16*(10), e0258137. https://doi.org/10.1371/journal.pone.0258137

Zubkov, A. (2022). Increasing effectiveness of foreign language teaching of transport university students in process of online learning. In Manakov, A. & A. Edigarian (Eds.) *International Scientific Siberian Transport Forum TransSiberia - 2021* (vol. 403). TransSiberia 2021. Lecture Notes in Networks and Systems. Springer, Cham.