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A tri-phenomenon perspective to mitigate MOOCs' high dropout rates: the role of technical, pedagogical, and contextual factors on language learners' L2 motivational selves, and learning approaches to MOOC

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Abstract

MOOC attrition rates have become a research hotspot in open and online education, requiring researchers to pinpoint psychological, technological, pedagogical, and technical factors that could mitigate this problem. For this aim, the current study applied a tri-phenomenon approach to explore language learners' perceptions of support coupled with the moderation role of their motivation plays in shaping their learning approaches to MOOC. To do so, 428 language learners who completed their online language course on the Iranian MOOC platform answered the study survey before getting their course certificate. An analysis of structural equation modeling (SEM) revealed that MOOC instructional and peer support were positively correlated with learners' deep approach while negatively correlated with the surface one. Although technical support was provided in this instance, it did not contribute to shaping language learners' motivation and deep approach. Moreover, language learners who attended MOOCs to learn language intrinsically perceived more instructional support, whereas language learners who joined these courses to pass some obligations or get course certificates perceived greater peer support that could help them pass such criteria and shape their deep approach to MOOC. Further, both types of motivation significantly mediate learners' instructional and peer support within their deep language learning approach in MOOC. As a result of these findings, both theoretical and practical contributions have been reported in the study to lead MOOCs' enrolment to have a deep approach.

Keywords: Massive open online courses (MOOC), L2 motivational self-systems (L2MSS), Learning approach, Technical support, Peer support, Instructional support

Introduction

By virtue of the extension of online learning technologies and the development of the open educational movement, MOOCs have come onto the educational stage and have opened up a new era of open and online schooling by broadening the boundaries of education for previously non-college-bound students to pursue their education in an

open, flexible, and self-directed learning context (Rahimi, 2023; Shanshan & Wenfei, 2022). While this type of online schooling was initially considered an attractive alternative to traditional schooling, it soon witnessed low completion rates, and high dropout rates prevailed in this form of online learning. In fact, the attrition rates among MOOC students often exceed 90% compared to campus-bound students (Xing & Du, 2018). Using data from edX's MOOC platform across courses and over time, Reich and Ruipérez-valiente, (2019) concluded that MOOCs' dropout rates have remained unchanged despite efforts to improve courses. Based on this, Rahimi and Tafazoli 2022a) found that high MOOC dropout rates are primarily due to psychological factors, such as motivation, contextual factors relating to enrollees' geographical characteristics, and instructional supports offered by MOOC platforms.

As a means to address these concerns, scholars have focused on students' engagement (Er et al., 2019; Jacobsen, 2017), autonomy (Jiang & Peng, 2023), motivation (Hsu, 2022; Rahimi & Cheraghi, 2022), emotion (Hsu, 2021; Shanshan & Wenfei, 2022) attitude (Hsu, 2022; Rahimi & Tafazoli, 2022), and self-regulation (Rahimi & Cheraghi, 2022) as basic psychological factors deemed essential to success in MOOCs (Jiang & Peng, 2023; Rahimi & Cheraghi, 2022; Rahimi & Tafazoli, 2022). In spite of the fact that motivation, attitudes, and autonomy play an important role in the success of online courses, these attributes do not guarantee learners will continue their courses in MOOCs. A recent study found that learners with higher levels of motivation and attitudes encountered a variety of technical, and pedagogical challenges in MOOCs (Ding & Shen, 2019; Rahimi & Tafazoli, 2022), resulting in reduced concentration levels and continued participation in MOOCs (Ding & Shen, 2019; Yeung & Yau, 2021), leading MOOC scholars to recommend, exploring learners' psychological wellbeing, and MOOC contextual factors (Chong et al., 2022; Hsu, 2021; Rahimi, 2023).

Due to this, several technical and contextual factors contribute to learners' psychological well-being in MOOCs, particularly instructional support, peer interaction, and technical support have yet to be studied in relation to learners' psychological factors. This implies that more research needs to be conducted to understand the psychological factors of learners as well as the MOOCs' educational contextual factors, which have not been covered in previous research, particularly in the Iranian EFL context (Mellati & Khademi, 2018; Rahimi, 2023). As a result, recent research on MOOCs has focused on participants' psychological factors, such as motivation, online self-regulation, or attitudes, and deemed them a prerequisite factor to why enrolments continue to participate in MOOCs or persist (Hsu, 2021; Rahimi, 2023; Shanshan & Wenfei, 2022). However, this study aims to go one step further in investigating learners' psychological well-being beyond motivation, attitudes, and self-regulation by incorporating students' approaches to online learning technologies (SAOLT), one of the newest conceptual framework that has yet to be integrated into MOOCs. In addition, this study will shift the focus from viewing psychological factors as prerequisites (e.g. Hsu, 2021, 2022; Rahimi, 2023; Shanshan & Wenfei, 2022) for learners' persistence in LMOOCs to seeing them as outcomes and mediators.

Taking these into account, the current study selected students' learning approaches (SAL) framework that incorporate learners' deep approach and surface approach (Pintrich, 2004). Recent research has shown that students' approaches in traditional learning

contexts were correlated with psychological factors such as motivation and enjoyment (Coertjens et al., 2016) and contextual factors such as perceived support from instructors (Smarandache et al., 2021). In light of the advancement of ICTs, scholars have recommended exploring learners' approaches in such contexts (Ellis & Bliuc, 2015, 2017; Han & Geng, 2023; Takase et al., 2020). Taking note of this recommendation and exploring learners' approaches in the MOOC context, the current study utilized the SAL framework to examine learners' learning experiences within MOOCs in relation to psychological and contextual factors.

Literature review

Students' approaches to online learning technologies (SAOLT)

Incorporating phenomenography works by Marton and Säljö (1976), resulted in the addition of the SAL framework to the literature, Ellis and Bliuc (2015; 2019) propose the SAOLT framework that was widely used to explore students' learning experiences and approaches in a technology-facilitated learning environment. According to SAL, learners' approaches are categorized into deep and surface approaches. The deep approach refers to learners' willingness to learn meaningfully via critical thinking, whereas the surface approach alludes to learners' desire to reproduce content through rote learning (Biggs, 1989). The application of these approaches, however, had a different definition in ICTs environments. According to Ellis and Bliuc (2015; 2019), the deep approach in the ICT environment refers back to students' effective use of ICTs to stimulate innovative thinking, which is closely linked to their intentions to compare and cross-reference various points of view, while the surface approach illustrates students' restricted use of ICTs as little as possible in order to minimize their workload and avoid establishing a meaningful online presence in that context. Following this view, the current study explores language learners' approaches to MOOCs.

Hypothesize formulation

Students' perceived support

Recent studies have indicated that environmental factors impacted students' approaches (Han & Geng, 2023; Smarandache et al., 2021; Yeung & Yau, 2021). Among the literature, there is consensus that the development of deep approaches to learning requires a supportive learning environment that integrates essential instructions such as the setting of clear course objectives, organizing learning activities, and connecting them to professional practice (Han & Geng, 2023; Smarandache et al., 2021; Zalazar-Jaime et al., 2021). In addition to providing academic and non-academic support to students, learning support such as instructional support, peer support, and technical support has been considered an integral part of influencing learners' performance since students' perception of such support has been considered a critical intervention construct, particularly in the technology-enhanced environment (Fang et al., 2018; Han & Geng, 2023). Accordingly, Lee et al. (2011) developed a tri-category of learners' perceived support in online learning environments. According to them, *instructional support* includes the guidance that course instructors provide students in the form of clear course objectives, suitable teaching materials, and timely feedback for students. *Peer support* alludes to mutual assistance between students regarding academic and non-academic matters due to peer

interaction, such as group discussions and peer assessments. *Technical support* entails assistance delivered to students experiencing technical difficulties maintaining a stable learning environment.

Students perceived support has been shown to play a significant role in their performance in research studies, particularly in an online learning environment. According to recent studies, when learners perceived instructional support, such as instructor feedback (Han & Geng, 2023; Luan et al., 2020), and clear course objectives (Langseth et al., 2022), they had better engagement and performance. Studies also reported that learners' peer support, such as peer feedback, significantly shaped their learning performance in MOOC (Hsu, 2021; Rahimi & Cheraghi, 2022) and lead facilitated a deep approach to online learning (Lahdenperä et al., 2021), and effective use of ICTs for education (Bringula et al., 2021; Han & Geng, 2023). Further, lack of support adversely affects students' performance in learning (He et al., 2019). For example, learners' perceptions of a less supportive environment and heavy workload can strongly correlate with their surface approach to learning (Baeten et al., 2010; Lahdenpera et al., 2021) and the limitations on the use of technology (Han et al., 2023). Technical support for online learning has also been widely documented, as many studies have demonstrated that learners who encounter technical difficulties (e.g., inadequate technical skills and equipment) or lack adequate technical assistance are more likely to hinder online learning (Zhang & Zou, 2022). Aiming to shed light on how learners' support in online, flexible, and massive context will shape their online language learning preference, the following hypothesizes developed by the researcher:

H1 Instructional support will positively predict learners' deep (H1a) and negatively predict surface approaches (H1b) to MOOC.

H2 Technical support will positively predict learners' deep (H2a) and negatively predict surface approaches (H2b) to MOOC.

H3 Peer support will positively predict learners' deep (H3a) and negatively predict surface approaches (H3b) to MOOC.

Language learners' instrumentalities in MOOCs

The importance of learners' motivation for learning has become increasingly evident in educational research, as it is directly related to their learning outcomes, as well as their ability to transfer knowledge and persist in learning (Li & Han, 2023; Yu et al., 2022), particularly in online language learning (Alobaid, 2020; Li & Han, 2023; Rahimi, 2023). Motivation has also played a crucial role in developing language learners' psychological and behavioral characteristics in MOOCs, such as self-regulation (Rahimi & Cheraghi, 2022), attitudes (Hsu, 2021, 2022; Rahimi, 2023), and engagement (Bartalesi-Graf et al., 2022; Hsu, 2022).

There have been a number of general constructs and theories developed for exploring language learners' motivation, including Gardner's socio-educational model (Gardner, 2010), that language learners learn a language for their external goals (instrument motivation) or integrate with the target context. (integrative motivation),

and self-determination theory (Deci & Ryan, 2012) in online language learning. Since learners do not have direct contact with the target learning context, the L2 motivational self-system (Dörnyei, 2009) has recently became the predominant theoretical framework in language learning contexts because integration is impossible in EFL contexts. As learners' primary motivation comes from the context and the use of language, the actual learning context and language use are the primary sources of motivation (Dörnyei., 2009). In this line, scholars recently recommended that language researchers shift their view beyond traditional motivational theories such as intrinsic, extrinsic, instrumental, and integrative motivation, as they neglected learners' L2-self identities (Rahimi, 2022, 2023; Rahimi & Cheraghi, 2022; Smith et al., 2020; Zheng et al., 2018), in which learners learn a language online for their personal objectives such as becoming a native speaker (instrumentality-promotion, IPO), or learn a language to pass some obligations and responsibilities such as obtaining a course certificate (instrumentality-prevention, IPR) based on their actual language use, and context.

The literature reports that learners' psychological factors in MOOCs, particularly motivation, attitudes, and enjoyment, were influenced by environmental factors, including peer support, technical assistance, and instructional support (Bartalesi-Graf et al., 2022; Ding & Shen, 2019; Hsu, 2022; Rahimi, 2023; Sak, 2022; Wang et al., 2021). The perception of environmental factors, including teacher and peer performance, were a significant factor in determining students' motivation in online learning environments (Huang et al., 2020; Rahimi, 2021; Zeng et al., 2020). The enrollees were more intrinsically motivated to learn in an online environment when they perceived feedback, comments, and support from their instructors (Mendoza et al., 2023; Zeng et al., 2020), and peers (Keskin et al., 2021; Zeng et al., 2020). Furthermore, studies concluded that due to technical difficulties and the lack of support, learners experienced extrinsic motivation to participate in MOOC (Celik & Cagiltay, 2023; Rahimi & Tafazoli., 2022; Wu, 2021). Furthermore, recent studies have examined how MOOC supports shape learners' behaviors in the Chinese (Wei et al., 2023), Oman (Al-Harthi & Ani, 2022), and Spanish (Khalil et al., 2023) contexts, but a local study on the Iranian EFL context is needed to mitigate the high dropout rates of it on a local, as well as global scales. To shed more light on uncovering the role of supports in shaping language learners' motivation, particularly their instrumentalities in online language learning and MOOC therefore, this study hypothesizes that Iranian EFL learners will have higher levels of instrumentality promotion and instrumentality prevention in MOOCs if they perceive more technical, instructional, and peer support.

H4 MOOC's instructional support will positively predict language learners' instrumentality promotion (H4a) and instrumentality prevention (H4b).

H5 MOOC's technical support will positively language learners' instrumentality promotion (H5a) and instrumentality-prevention (H5b).

H6 MOOC's peer support will positively language learners' instrumentality promotion (H6a) and instrumentality-prevention (H6b).

It has been demonstrated that L2-motivational self-systems play a critical role in predicting the cognitive, behavioral, and emotional aspects of language learners in online and flexible language learning contexts (Adolphs et al., 2018; Lamb & Arisandy, 2019; Henry & Cliffordson, 2017; Rahimi & Cheraghi, 2022; Rahimi, 2023; Smith et al., 2020; Zheng et al., 2018). The work of Zheng et al. (2018) highlighted the role of Chinese Ideal future selves in predicting online regulation, factoring in goal-setting, task management, environment structure, and self-evaluation. Similarly, Smith et al. (2020) found that learners' efforts at learning English online were driven by their ideal L2 self. Based on the replication of Zheng et al. (2018) work in the Iranian context as well as MOOCs, Rahimi et al. (2022) concluded that Iranian EFL learners' positive self-image, as well as others' expectations and achieving academic standards to reach their ideal goals, shaped their online regulation. A subsequent study by Rahimi (2023) found that Iranian EFL learners' motivational self-systems, such as their ideal-future self and ought-to-L2 self, positively contributed to their perception of MOOC as a useful and ease of use online platform for language learning.

A number of studies have also demonstrated that language learners' motivations, such as integrative and flow motivation (Wang et al., 2022), intrinsic motivation (Mendoza et al., 2023), self-efficacy (Alemayehu & Chen, 2021), and self-determination (Hsu, 2022), have been identified as mediators of cognitive, emotional, and behavioral aspects of online language learning. A further study is needed to examine the mediation role played by language learners' L2 self-identities in such contexts, especially in the context of MOOC. There has also been an examination of the role of the learners' Ideal L2 selves on behavioral factors such as effort (Smith, 2020), online self-regulation (Rahimi & Cheraghi, 2022; Zheng et al., 2018), and emotional factors such as attitudes (Rahimi, 2022). Literature has not yet addressed its role in shaping language learners' approaches to MOOC.

It has been demonstrated in previous studies that learners' motivation is context-specific (Dornyei, 2013; Dornyei & Ryan, 2015), which means that motivation exhibits different behaviors depending on the environment in which the course takes place. As reported by recent studies, language learners in Eastern countries such as China (You & Dörnyei, 2016) and Iran (Rahimi, 2023) rely on both instrumentality promotion and instrumentality prevention, while language learners in Western countries primarily rely on the promotional side of instrumentality (Henry & Cliffordson, 2017; Lamb & Arisandy, 2019). Furthermore, it is among the most critical psychological components of dynamic complex systems in the acquisition of second and foreign languages (Oxford, 2016a, 2016b), and researchers are recommended to connect this variable to other variables and uncover how it behaves in other language learning context, and impact learners' language learning performance (Freeborn et al., 2022; Mercer, 2018; Paradowski & Jelińska, 2023; Rahimi, 2023). Taking up this call, the researcher intends to explore language learners' motivational behavior in another language learning context, with other variables, and explore its behavior as a dependent, independent, and mediator role. It is for this reason that the researcher develops the following hypotheses:

H7 Language learners' instrumentality-promotion will positively predict deep (H7a), and negatively predict surface (H7b) approaches to MOOC.

H8 Language learners' Instrumentality-prevention will positively predict their deep (H8a), and negatively predicts surface (H8b) approaches to MOOC.

H9 Language learners' instrumentality-promotion will positively mediate the correlation between their perceived (H9a) instructional support, (H9b) technical support, (H9b) and peer support with their deep approach to MOOC.

H10 Language learners' instrumentality-promotion will negatively mediate the correlation between their perceived (H10a) instructional support, (H10b) technical support, (H10c) and peer support with their surface approach to MOOC.

H11 Language learners' instrumentality-promotion will positively mediate the correlation between their perceived (H11a) instructional support, (H11b) technical support, (H11c) and peer support with their deep approach to MOOC.

H12 Language learners' instrumentality-promotion will negatively mediate the correlation between their perceived (H12a) instructional support, (H12b) technical support, (H12c) and peer support with their surface approach to MOOC.

Literature gap and study aim

The literature suggests that the high dropout rates associated with MOOCs may be reduced by both MOOCs' factors, such as contextual, pedagogical, and technical, as well as learners' factors, particularly psychological ones, despite the existence of a large body of literature suggesting that no studies have yet to be conducted to examine all of these factors simultaneously in Language MOOC, particularly in the field of computer-assisted language learning (CALL). In fact, recent studies have examined the significant roles of technological factors in shaping learners' attitudes toward MOOCs (Hsu, 2021; Meet et al., 2022). The impact of peer support on learners' motivation has also been studied (Rahimi & Tafazoli, 2022; Wu, 2021; Yilmaz et al., 2022); however, none of them simultaneously explored the pedagogical, contextual, and technical aspects of it that influence learners' motivations and their approaches to MOOC. Moreover, a majority of previous studies on MOOC examined the relationship between language learners' psychological factors in this context, including the relationship between motivation and online self-regulation (Rahimi & Cheraghi, 2022; Zhu & Doo, 2021), attitudes (Hsu, 2021; 2022 Rahimi, 2023; Rahimi & Tafazoli, 2022) personal characteristics (Hsu, 2021; Shanshan & Wenfei, 2022) engagement and autonomy (Fang et al., 2018; Jiang & Peng, 2023); however, it was not explored whether it was related to the way of shaping learners approaches to it or not.

Additionally, the role that language learners' L2 self-identities or instrumentalities play in shaping their online language learning efforts (Smith et al., 2020), self-regulation (Rahimi & Cheraghi, 2022; Zheng et al., 2018), and their attitudes (Hsu, 2021, 2022; Rahimi, 2023; Rahimi & Tafazoli, 2022) to LMOOC, and other online language contexts, have been explored; however, its role has not been investigated in terms of their mediation in shaping language learners' approaches to MOOC. Moreover, SAOLT has been applied in learning management systems (e.g., Bringula et al., 2021; Han & Geng, 2023)

and blended learning (Ellis & Bliuc, 2015; 2019); however, the exploratory power of SAOLT to predict learners' approaches to MOOC has yet to be investigated. As a result of the above gaps in the literature, this study will apply a tri-phenomenological perspective to explore the mechanisms by which MOOC's technical, pedagogical, and instructional supports shape language learners' motivation and approaches to it, as well as how motivation plays a vital role in mediating this sequential mechanism.

Methodology

Study design

This study explores the role of MOOCs in influencing language learners' motivation and approaches to the context through a serial mechanism, as well as how motivation mediates this mechanism through MOOC instructional, technical, and peer support. The researcher was in need of flexible data collection and a large number of participants, which prompted him to select a quantitative design utilizing correlational analysis, specifically the structural equation modelling (SEM) approach. This approach was selected by the researcher because this quantitative correlational approach can examine complex structural relationships between latent variables and simultaneously examine the relationship between them within their error estimation, resulting in valid evaluation (Byrne, 2016). Additionally, it is also possible to analyze the indirect effects of the third variable, which plays an intermediate role in the relationship between the independent and dependent variables, that cannot be evaluated qualitatively (Hair et al., 2021).

Participants and research context

The MOOC targeted in the study is one of the Iranian MOOC platforms, namely Maktabkhoone, a well-known Iranian online platform supported by the Iranian education ministry and collaborates with more than seven public universities in Iran. Due to the equal and independent eligibility of all participants, the researcher has chosen a non-probability sampling method (Ary et al., 2010) to test the study hypotheses. Accordingly, with the collaboration of the executive manager of this platform, the questionnaire link was uploaded to the course and sent to the participants' Email who took the course titled General English for intermediate students. In the course, there were 14 h of video instruction plus 24 h of activities, including tests, quizzes, and other assessments. The course lasted about three months. Prior to participating in this MOOC, learners were evaluated for their proficiency in the English language by passing an English proficiency test administered by the MOOC itself.

From March 2021 to November 2022, study data were collected. This platform offered some courses with purchase for students, and they could access them without any time limits. 428 intermediate language learners were surveyed, including 150 females and 278 males, and most were between 19 and 26 years old (73.1%) and had experience with online language learning for 1–2 years (88.1%), 3–4 years (7.5%), or more than four years (4.4%). A total of 377 students had language learning experience between one and three years (71.7%), 113 between four and seven years (26.4%), and the remaining had more than seven years (1.9%). A description of the demographic characteristics of the study participants is provided in Table 1.

Table 1 Participants' Demographic Information

		N	%
Gender	Male	278	65.0
	Female	150	35.0
	Years		
Age	< 18	15	3.5
	19–26	313	73.1
	27–31	75	17.5
	31–40	19	4.4
	< 40	6	1.4
	Years		
Online Language	1–2	377	88.1
Learning	3–4	32	7.5
Experience	4 <	19	4.4
Language	1–3	113	26.4
Learning	4 < 7	307	71.7
Experience	7 <	8	1.9

Instruments

The measurement items had to be adapted to the study context to test the hypotheses. In this regard, the researcher selected and adapted measurement items based on the relevant literature to assess the perception of language learners' support, including technical (three items) such as (the technical support responded to my issues in this platform in a timely manner), instructional (three items, e.g., the objectives of this online course were clearly outlined), and peer (four items, students on this platform were willing to provide help to others), from Lee et al. (2011). To explore the role of IPO (e.g., learning English online is critical to me because others will respect me more if I can use English like a native speaker) and IPR (e.g., I have to learn English on this platform as I should get the course certificate) as mediators, three items for both of them from Zheng et al. (2018) were adopted. As a means of evaluating participants' approaches, four items were adopted for the deep approach (e.g., I find using this online platform will help me to develop my language proficiency) and three items for the surface approach (e.g., I restrict my use of this platform for learning the English language to as little as possible), respectively, from Ellis and Bliuc (2015; 2019).

The descriptive statistics of the measured variables are provided in Table 2. Accordingly, the mean scores ranged from 3.30 to 4.25. The standard deviation ranged from 0.78 to 1.07. The kurtosis coefficient and the tensile coefficient of skewness were calculated to verify that the exogenous variables were normality distributed. The results of the normalization examination of the exogenous variables showed that the values of kurtosis and skewness were within (− 1 to + 1), which indicates that there is no deviation from normality according to the criterion developed by Fabrigar et al. (1999). The Cronbach's alpha index of the variables exceeds the borderline limit of 0.7, showing a reliable and acceptable level. of reliability.

Table 2 Variable descriptive statistics

Variables	Measures of data distribution		Measures of dispersion		Measures of central tendency
	Kurtosis	Kurtosis	Variance	Std. Deviation	Mean
TS	− 1.002	− 0.426	0.856	0.925	3.98
IS	− 0.098	− 0.877	0.570	0.754	4.25
PS	− 0.085	− 0.837	0.884	0.940	3.46
IPO	.0048	− 0.886	0.815	0.902	4.07
IPR	− .0301	− 0.629	1.032	1.01	3.87
DA	− .0056	− 0.544	0.569	0.754	3.30
SA	− .0435	− 0.599	0.890	0.943	3.96

Data analysis

Initially, preliminary data analysis showed that the data were normally distributed, with no missing data. Confirmatory factor analysis (CFA) was performed to verify latent variables' factorial structures. Finally, SEM, and mediation analysis were run using analysis of a moment structures (AMOS 24) to test the study hypotheses. The researcher selected covariance-based SEM since it can be used simultaneously for multiple levels of dependencies, "where a dependent variable becomes an independent variable in subsequent relationships within the same analysis" (Shook, Ketchen, Hult, & Kacmar, 2004, as cited in., Astrachan et al., 2014, p.1). Moreover, Hair et al. (2021) claimed highlighted that it is the best tool for exploring several correlations and mediations with a large sample size.

Result

Before calculating the SEM analysis, to explore the reliability and validity of the study variables, the researcher evaluated the variable's validity and reliability in the measurement model. Accordingly, the construct validity and reliability were checked using the average variance extracted (AVE), the composite reliability (CR), Cronbach alpha and the factor loadings. For the AVE, a threshold of greater than 0.50 is recommended (Byrne, 2016); for the CR and Cronbach alpha, a threshold of 0.70 is recommended (Byrne, 2016); and for factor loadings, it is recommended to have a threshold of greater than 0.50 (Byrne, 2016). The composite reliability and Cronbach's alpha value both exceeded 0.7. The convergent validity of the latent variables exceeded 0.50, which is greater than their maximum shared variance (MSV), as shown in Table 3. Figure 1 also shows the factor loadings which are obtained greater than 0.5

For discriminant validity, the research at the same time applied the Ferner and Larker criterion (1981), as well as the Heterotrait-monotrait ratio (HTMT) criteria proposed by Henseler et al. (2015). As Ferner and Larker (1981) pointed out, a square root of a variable's AVE should be higher than its correlation value with all other variables, which is the case in Table 4.

In addition, the latent variables' discriminant validity was evaluated per the HTMT criteria proposed by Henseler et al. (2015). It assesses the average correlation between indicator items and other indicators. In accordance with Henseler et al. (2015), this value should not be greater than 0.85 or 0.90. construct validity of the latent variable; the CFA was applied. Table 5 displays the result of the HTMT.

Table 3 Reliability, and validity of the study variables

Variables	Cronbach alpha	CR	AVE	MSV
TS	0.747	0.771	0.531	0.018
IPO	0.867	0.868	0.687	0.255
DA	0.813	0.828	0.548	0.400
PS	0.841	0.853	0.594	0.387
IS	0.780	0.784	0.548	0.311
SA	0.803	0.812	0.592	0.311
IPR	0.867	0.867	0.685	0.400

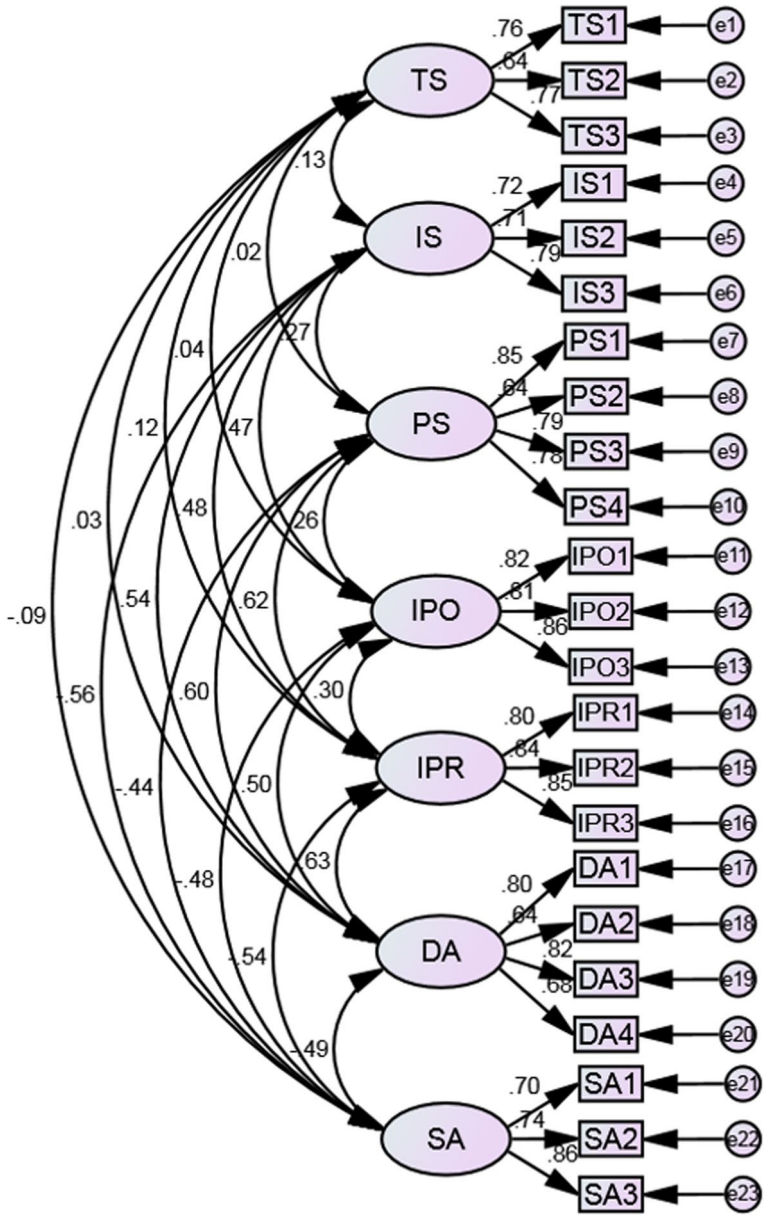

Fig. 1 Measurement model assessment

Table 4 Result of the discriminant validity

Variables	TS	IPO	DA	PS	IS	SA	IPR
TS	0.729						
IPO	0.043	0.829					
DA	0.028	0.505***	0.740				
PS	0.019	0.258***	0.601***	0.771			
IS	0.132*	0.469***	0.538***	0.269***	0.740		
SA	− 0.094	-0.479***	− 0.491***	− 0.436***	− 0.558***	0.769	
IPR	0.119*	0.300***	0.633***	0.622***	0.479***	− 0.543***	0.828

Table 5 Heterotrait-monotrait ratio (HTMT)

	TS	IPO	DA	PS	IS	SA	IPR
TS							
IPO	0.047						
DA	0.031	0.536					
PS	0.037	0.250	0.615				
IS	0.133	0.468	0.563	0.271			
SA	0.100	0.495	0.513	0.467	0.585		
IPR	0.134	0.306	0.655	0.646	0.487	0.560	

Table 6 The Study Model Fit Indices

GFI	IFI	CFI	NFI	SRMR	RMSEA	x2/ df
0.935	0.970	0.975	0.927	0.04	0.039	1.539

Further Statistical validation of the relationship between the observed and latent variables was also conducted due to the degree of freedom (× 2/ df). The Comparative Fit Index (CFI), the Goodness of Fit Index (GFI), the Root Mean Squared Error of Approximation (RMSEA), Standard Root Mean Square (SRMR) the Normed Fit Index (NFI), and the Incremental Fit Index (IFI) ranged in acceptance ranges of values recommended by Byrne (2016) and presented in Table 6.

In order to evaluate causal relationships between the main variables and their constituents, a bootstrap direct analysis in SEM was conducted with error measurement. In the initial SEM model test, a good fit was found with acceptable fitting indices (x2df = 1.53, RAMSEA = 0.03, NFI; 0.97, SRMR = 0.04; CFI = 0.97, IFI = 0.97, GFI, 0.93), and a summary of the direct regressions were analyzed, with its associated significance indicated in Table 7. All of the perceived support factors significantly supported the study hypotheses, except for TS, which did not significantly predict learners' approaches (H2a ß = -0.040, $p > 0.05$; H2b ß = -0.012, $p > 0.01$), and both instrumentalities (H5a ß = 0.065, $p > 0.01$; H5b ß = 0.017, $p > 0.01$). Moreover, instructional support had the highest regression path with Instrumentality-promotion (H4a ß = 0.553, $p < 0.01$); meanwhile, peer support had the highest regression path with

Table 7 Result of the direct effects of learners' perceived supports on their L2 motivational self-system and approaches to MOOC

Hypothesizes	Parameter			Beta	Lower	Upper	*P*
H1a	Instructional support	→	Deep approach	0.234	0.095	0.373	0.004
H1b	Instructional support	→	Surface approach	−0.315	−0.442	−0.198	0.001
H2a	Technical support	→	Deep approach	−0.040	−0.109	0.030	0.345
H2b	Technical support	→	Surface approach	−0.012	−0.078	0.056	0.797
H3a	Peer support	→	Deep approach	0.339	0.143	0.324	0.001
H3b	Peer support	→	Surface approach	−0.110	−0.187	−0.036	0.014
H4a	Instructional support	→	Instrumentality-promotion	0.553	0.410	0.699	0.001
H4b	Instructional support	→	Instrumentality-prevention	0.428	0.290	0.580	0.001
H5a	Technical support	→	Instrumentality-promotion	0.065	−0.015	0.154	0.175
H5b	Technical support	→	Instrumentality- prevention	-0.017	−0.103	0.073	0.793
H6a	Peer support	→	Instrumentality-promotion	0.127	0.034	0.218	0.029
H6b	Peer support	→	Instrumentality-prevention	0.486	0.403	0.578	0.001
H7a	Instrumentality-promotion	→	Deep approach	0.206	0.136	0.291	0.001
H7b	Instrumentality-promotion	→	Surface approach	−0.196	−0.278	−0.115	0.001
H8a	Instrumentality-prevention	→	Deep approach	0.219	0.112	0.337	0.002
H8b	Instrumentality-prevention	→	Surface approach	−0.198	−0.298	−0.093	0.003

learners' instrumentality-prevention in MOOC (H6b ß = 0.486, $p < 0.01$). Also the structural model fit indices are presented in Table 6.

To explore the mediation roles of both instrumentalities on the correlations between learners' perceived supports in MOOC and their approaches to it, the researcher applied indirect mediation analysis with 5000 subsamples. Accordingly, it was shown that except for technical support (H9b; H10b; H11; H12b), both instrumentality promotion and instrumentality prevention positively mediated between language learners' perceived support and their approaches to MOOC. Table 8 presents the results of the serial mediation analysis with coefficients of intervals. In addition, Fig. 2 depicts the study model.

Discussion

The factorial structure of the SAOLT

As presented in the CFA, the SAOLT factorial structure has been validated in the MOOC context, especially in the context of language MOOCs, since this theoretical framework has not been applied to the evaluation of learners' psychological well-being within MOOCs. Accordingly, this first order of SEM follows Ellis and Bliuc's (2015) recommendation that this framework should be validated in other online environments in order to enhance its exploratory power.

The correlation between language learners perceive supports and their approaches

The results of the SEM analysis showed that MOOC's instructional support was positively related to the deep approach to online language learning and negatively related to the surface approach. This indicates that when language learners perceived that they were provided with appropriate instructions, such as clear goals, and useful materials, they were more likely to perceive the usefulness of LMOOC in furthering their purposes

Table 8 Result of the serial mediation analysis

Hypothesizes	Indirect effects			Beta	Lower	Upper	*P*
H9a	Instructional support	→	Instrumentality- promotion → Deep approach	0.114	0.072	0.168	0.001
H9b	Technical support	→	Instrumentality-promotion → Deep approach	−0.003	−0.023	0.016	0.793
H9c	Peer support	→	Instrumentality- promotion → Deep approach	0.026	0.006	0.049	0.029
H10a	Instructional support	→	Instrumentality-promotion→ Surface approach	−0.108	−0.164	−0.062	0.001
H10b	Technical support	→	Instrumentality-promotion→ Surface approach	0.003	−0.015	0.020	0.793
H10c	Peer support	→	Instrumentality-promotion→ Surface approach	−0.025	−0.046	−0.006	0.029
H11a	Instructional support	→	Instrumentality-prevention→ Deep approach	0.094	0.042	0.161	0.002
H11b	Technical support	→	Instrumentality-prevention→ Deep approach	0.014	−0.003	0.035	0.176
H11c	Peer support	→	Instrumentality-prevention→ Deep approach	0.106	0.052	0.166	0.002
H12a	Instructional support	→	Instrumentality-prevention→ Surface approach	−0.085	−0.137	−0.040	0.003
H12b	Technical support	→	Instrumentality-prevention→Surface approach	−0.013	−0.036	0.002	0.176
H12c	Peer support	→	Instrumentality-prevention→ Surface approach	−0.096	−0.150	−0.045	0.003

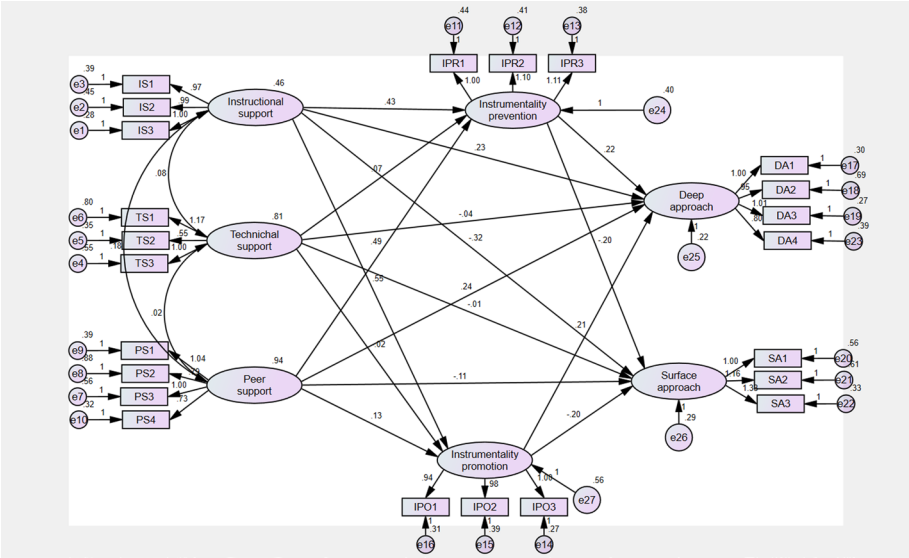

Fig. 2 The study model

and using them in an aligned way with deep approaches to language learning. It has been found, in previous studies, that the perception of instructional support had a positive relationship with students' deep approach, particularly in an online learning environment (Alobaid, 2020; Han & Geng, 2023; Lahdenperä et al., 2021; Smarandache et al., 2021; Zalazar-Jaime et al., 2021). Additionally, it seems to echo what local (Mellati &

Khademi, 2018; Rahimi & Cheragi., 2022; Rahimi, 2023), and international studies that (Bartalesi-Graf et al., 2022; Hsu, 2021) emphasized that the correlation between MOOCs' clear objectives and language learners' personal and professional goals elevated EFL learners' online self-regulation, motivation, and attitudes to complete MOOCs, and this study added this to language learners' deep approach. It is also consistent with the conclusion in Kim and Song (2021) that MOOCs are easy to use as a result of their course design, facilitation, and direct instruction.

Moreover, the direct analysis showed that learners received peer support as a significant factor in shaping their deep approach to learning in MOOC and negatively predicted their surface approach. An intriguing point to note is that PS had a greater coefficient (ß = 0.339) when it came to learners' deep approach in MOOCs compared to IS (ß = 0.233). Possibly, this is due to a lack of instructors' corrective feedback on MOOCs, which has been highlighted as one of the negative aspects of MOOCs in the literature (Kim & Song, 2021; Rahimi, 2023). However, a lack of this feature may contribute to learners taking the initiative to be self-depend and self-discover to ask others for assistance within MOOC platforms, leading to a sense of peer support and a deep language learning approach in MOOC. This is in conjunction with earlier findings suggesting that students' perception of peer support can positively affect their attitudes to successfully completing MOOCs (Kim and Song, 2021; Rahimi, 2023).

Neither H2a nor H2b was supported by the findings. Thus, technical support had no significant influence on language learners' both approaches to MOOC. It could relate to the MOOCs' flexibility features, particularly their asynchronous online learning in which learners can follow their course at any time; if there is any technical problem, such as a cutoff in power or an interruption in internet service they can continue their course in another time (Rahimi & Tafazoli., 2022) Thus, it did not influence their approaches to MOOC.

Furthermore, the study's results showed that among the correlations between language learners' perceived support in MOOCs and their instrumentalities, only instructional support and peer support were of predictive significant value. Moreover, the instructional support had higher shared variance with learners' instrumentality-promotion (ß = 0.553), while the peer support had more shared regression weights with instrumentality-prevention (ß = 0.486), showing that MOOC's course guidelines and objectives were in line with learners' personal goals to learn the language, escalating their promotional side of their instrumentalities than prevention ones. In fact, if language learners perceive MOOC as having clear educational goals, and peer support, they may reach their personal dreams of acquiring another language in this context, This echoes Rahimi and Cheraghi (2022), stating that "the ideal possible self relies on language learners' commitment and satisfaction with the distance between their current and future self in MOOC" (p. 19); one component that might cover this gap is the instructional support provided by MOOC, which is found in this study. Several studies have demonstrated the importance of authentic material in MOOCs and the inclusion of clear objectives within preplanned schedules to shape language learners' motivation (Ding & Shen, 2019; Hsu, 2021; 2022; Rahimi, 2023).

On the other hand, the collaborative and flexible nature of the MOOC makes it feasible for language learners to support each other in the absence of course instructors, as

well as provide directive feedback to assist each other in passing their external obligations (such as course certificates). Those results are consistent with Carroll et al. (2015), reported that an individual with awareness of his or her abilities and objectives to learn a language can attain his or her objectives if he or she finds the appropriate learning environment. Studies also indicated that a supportive context could elevate students' motivation (e.g., Han & Geng, 2023; Jacobsen, 2017), which can consequently influence their intentions to employ the MOOC (Kim and Song, 2021; Hsu, 2021; 2022; Rahimi, 2023). A further advantage of MOOCs was highlighted by Rahimi (2023), that enrolments at any point in their lives could take part in these courses and enlist the assistance of a professional student at a higher level who had already passed the criteria ahead of them to gain further experience. In addition, TS was not significantly correlated with language learners' motivation in MOOCs, contrary to previous studies that reported that technical factors were positively correlated with learners' attitudes or motivation (Hsu, 2021; Rahimi & Tafazoli, 2022).

Additionally, the present study revealed a significant correlation between motivational factors and learners' approaches to MOOC. Keeping in line with recent studies, this study found that instrumentality-promotion and instrumentality-prevention positively influence student orientation toward deep learning in MOOC. Due to this, language learners' Using MOOC to deepen their understanding and accelerate their language proficiency was highly valued by language learners with both instrumentality-promotion and instrumentality-prevention. According to recent research, not only did motivation keep language learners focused on language learning content in MOOCs (Ding & Shen, 2019; Hsu., 2021; 2022), but it also led them to be persistent in these courses (Chong et al., 2022; Rahimi, 2023). This is also in accordance with studies that showed Eastern students were more motivated to learn a language than Western students, particularly Iranian students (You & Dörnyei, 2016; Rahimi, 2023), demonstrating the dynamic nature of motivation, which exhibits different shapes in different contexts (Henry & Cliffordson, 2017; Lamb & Arisandy, 2019; Rahimi, 2023; You & Dörnyei, 2016).

In addition, this may also be due to the *authenticity gap*, a phenomenon introduced and validated in the Iranian EFL context by Rahimi (2023), which suggested that language learners put more effort, motivation, and attitudes into unstructured language contexts, specifically language MOOCs (LMOOCs), due to the flexibility of MOOCs in regard to course subjects and objects, the flexibility of time and location of online language learning and the open and inter-cultural community, with higher levels of multimodality of target language context, language learners were motivated to acquire a language incidentally, and on their own, with peer and instructional support, as opposed to learning a language in front of a mirror in a teacher's classroom, where they were instructed to repeat what the teacher says (Rahimi, 2023).

The mediation role of language learners' motivation between their perceived supports, and language learning approaches in MOOC

Moreover, the results confirm the mediating effect of language learners' motivations between their perceived supports in MOOC, and their approaches to it. In addition, both of them served as complementary mediators for technical, peer, and instructional

support since they did not alter the direction or significance levels of learners approaches to MOOC. As a follow-up to previous researchers' recommendations, to examine the role of motivation as a crucial psychological component in dynamic complex systems (Freeborn et al., 2022; Mercer, 2018; Oxford, 2016a, 2016b; Paradowski & Jelińska, 2023; Rahimi, 2023), this finding showed that not only it affected language learners' behaviors in MOOC, but it also impacted the correlation between pedagogical, technological, and contextual supports as with their approaches to it as well.

Conclusion and implication

This study aims to provide insights into Iranian EFL learners' perceptions about the support they received and their approaches to LMOOCs, as well as the role that their instrumentalities play as moderators. The study's results may contribute to theoretical and practical contributions to the field of MOOCs, education, and CALL. When it comes to the theoretical aspects, with its tri-pheromone perspectives, this study provides value to the literature regarding mitigating LMOOCs' high dropout rates by taking into consideration the technical, pedagogical, and psychological aspects of both language learners and the MOOC context. To the best of the researcher's knowledge, this is one of the first studies examining the role of MOOC supports in shaping language learners' approaches in this context, in addition to the mediation role of their language motivation. Additionally, the study validated SAOLT within a MOOC context and expanded its application for predicting enrolment psychological well-being in this large and flexible environment. Due to this, the study concept model may relate to the current literature on open and online language learning, CALL, and LMOOC.

While respecting the practical aspect, LMOOC designers are encouraged to enhance course quality and variety by utilizing a variety of materials, aligning with learners who seek to learn on the basis of their intrinsic motivation as well as for their personal purposes, and for those who attend these courses merely to pass some academic requirements or other obligations. It is also recommendable that they provide clear lesson plans before enrolling in MOOCs so that the enrolment can determine whether their objectives align with the course outline, preventing low course completion rates during the course. The second thing that they should do is increase the open feature communities of their platforms and make their MOOCs available in other contexts, as some MOOC platforms were unavailable in the Iranian EFL context (Rahimi & Tafazoli, 2022); as a result, the cross-cultural community of MOOCs would grow, which could increase peer support for this platform, potentially replacing the instructor's feedback.

In spite of the fact that this study has several implications, data collection is limited. To begin with, data was collected based on self-reported surveys. Future research should therefore use qualitative design. A conceptual model can also be extended, tested, or validated on other MOOC platforms, or research contexts. Further exploration of other psychological factors that moderate learners' perceptions of support and their approaches in this context is also recommended.

Appendix: The study questionnaire

Language learners' perceived support in MOOC:

Peer support.

1. Students on this platform were willing to help others.
2. There were many opportunities to interact with peers and asking help in MOOC
3. Students in MOOC were willing to provide help to other students
4. I enjoyed the group discussions in MOOC

Technical support.

1. The technical support responded to my issues on this platform promptly.
2. I knew where to ask for help when I had any technical issues in MOOC.
3. I could get technical support in MOOC when I needed it.

Instructional support.

1. The objectives of this online course were clearly outlined
2. I knew what I was expected to accomplish each week.
3. The course provided resources relevant to this course

Language learners' instrumentalities (L2 motivational self-system).

Instrumentality-promotion.

1. Learning English in MOOC is important to me because other people will respect me more if I have a knowledge of English.
2. Learning English in MOOC is essential for me because my life would change in the future by acquiring the language.
3. Learning English in MOOC is important to me because an educated person is supposed to be able to speak English.

Instrumentality-prevention.

1. I have to learn English on this platform as I should get the course certificate.
2. I have to learn English on this platform as I don't want to fail this course.
3. When thinking of not becoming a successful online English language learner, I feel scared.

Language learners' approaches to MOOC.

Deep approach.

1. I try to use MOOC to develop my language proficiency.
2. I find using this online platform will help me to develop my language proficiency
3. I try to use MOOC to learn language to communicate with other participants and improve my language proficiency.

4. I find using MOOC for language learning helps me to develop my language proficiency.

Surface approach.

1. I do not use MOOC for learning language to achieve my goals.
2. I do not find using MOOC to improve my language proficiency.
3. I restrict my use of this platform for learning the English language to as little as possible.

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Single author / not applicable. I confirm that the manuscript has been read and approved by the author and that there are no other persons who satisfied the criteria for authorship but are not listed.

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Data availability
The datasets used during the current study are available from the corresponding author on reasonable request.

Declarations

Competing Interests
The author declares no competing interests.

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Publisher's Note

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