



A pathway from surface to deep online language learning approach: The crucial role of online self-regulation

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ABSTRACT

Students' approaches to online technologies (SAOLT) have garnered significant support among scholars from a variety of fields, particularly in the field of science, technology, engineering, and mathematics education (STEM). The humanistic field needs to explore learners' approaches to target learning contexts, especially in the fields of computer-assisted language learning (CALL) and psycholinguistics. To fill this gap, the researchers explored 686 Iranian high school EFL learners' approaches to online language learning (OLL) with regard to their pedagogical, technical, and peer support, as well as the mediation role of online self-regulation. The partial least squares modeling approach's (PLS-SEM) reflective analysis validated the factorial structure of the conceptual study framework in online language learning and secondary education. The formative model found that instructional and peer support positively impacted language learners' deep and surface approaches to online language learning, thereby maximizing and minimizing their online presence and meaningful language learning. Furthermore, the mediation analysis revealed the significant moderating influence of learners' online self-regulation, which shifted the correlations from relating both learners' perceived support to their surface and deep learning approaches to only relating to the deep learning approach. Consequently, this study has pedagogical implications as it introduces a new conceptual framework to the CALL and psycholinguistic domains, specifically incorporating a new psychological factor related to language learners' complex dynamic systems, known as Language Learners' Approaches to Online Language Learning (OLLA). To do so, the researchers suggested that instructors should design more practical activities for theoretical subjects such as English language learning in online learning and shift online teaching from teacher-centered to peer-centered so as to foster their learners' deep learning approach to online language learning.

1. Introduction

Student Approaches to Learning (SAL) is one of the research hot spots in tertiary education, aiming to identify key factors that explain students' success in higher education (Pintrich, 2004). Resulting from the development and integration of Information and Communications Technologies (ICTs), which was defined by Liverpool and cited by Daramola and Aladesusi (2022), it is the collection of digital and electronic devices, applications, communication devices, hardware, and software used to retrieve, process, store, and transmit information by computers and other technologically based systems.

The development of online learning, which is a form of learning that occurs outside of the physical classroom and is carried out by educators who are separated from their students and can be schooled at synchronous or asynchronous levels (Eseadi, 2023; Oguguo et al., 2023), led the

integration of SAL into the university context has contributed to a new conceptual framework for exploring students' approaches to online learning technologies (SAOLT) (Ellis & Bliuc, 2015, 2019) in various fields of study such as mathematics (Lahdenperä et al., 2021), food science (Schmidt, 2020), and STEM education (Han & Geng, 2023; Smarandache et al., 2022; Zakariya et al., 2020). In this framework, however, the role and place of online language learning (OLL) remain unclear since, in this field, the objectives are considerably different than in the previous fields, where grammar, lexical, intercultural communication competencies (ICC), and language learners' skills and subskills are among the objectives of the course.

SAL research distinguishes between deep and surface approaches, each of which significantly impacts qualitative outcomes differently (Ellis & Bliuc, 2019; Rahimi, 2024). Generally, the deeper learning approach is associated with higher academic grades as learners seek to

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discover tasks' underlying meaning and purpose (Pintrich, 2004). On the other hand, the surface approach is fragmented; it is characterized by formulaic and reproducible strategies that have little or no intention of reaching the underlying meaning of the tasks, and it is associated with relatively lower levels of learning (Pintrich, 2004). Since online language learning caters to more customized, self-directed language learning opportunities for language learners, its quality is determined by technical, technological, pedagogical, and psychological factors (Han & Geng, 2023; Rahimi, 2024).

Recently, there have been studies that indicate language learners face technical challenges such as electrical power outages (Hajar & Manan, 2022), pedagogical challenges such as lack of feedback (Hajar & Manan, 2022), or concentration issues that may be related to psychological factors such as a lack of self-regulation (Rahimi & Cheraghi, 2022; Zheng et al., 2018). These problems may negatively affect language learners' performance, particularly their approaches to language learning within the online learning context, which still need to be addressed. It is, therefore, essential to investigate language learners' approaches to OLL and identify what technical, psychological, and pedagogical factors may relate to other aspects of the SAL framework. As recommended by Gimeno-Sanz (2015), and Colpaert (2020), CALL and English language teaching will continue to advance as technological advancements continue, and scholars should develop innovative methods to teach English with technology in both practical and theoretical senses. Furthermore, language learners' psychological factors are contextually specific, and they act independently, as well as correlate to each other, according to dynamic complex systems (Freeborn et al., 2022; Larsen-Freeman & Cameron, 2008; Mercer, 2018; Oxford, 2016a, 2016b; Rahimi et al., in press). This co-correlation in online language learning, particularly their online self-regulation and deep and surface approaches to this learning environment, has not been investigated. By exploring these correlations, we can extend the humanities, CALL, and online language learning literature by validating the factorial structures of SAL in online language learning and have practical implications to show how pedagogical experts, language teachers, and students themselves can have an impact on their language learning approaches to online language learning approaches, particularly through effective online self-regulation strategies.

To heed these gaps and recommendations and put one step forward, this study will introduce a new conceptual framework of SAL, specific for online language learning, namely Online Language Learning Approaches (OLLA). A secondary objective of the study will be to validate this framework in high school education, particularly with respect to English language learning, instead of in tertiary education. The study also examines what pedagogical, peer, and technical support shapes language learners' approach to online language learning (OLL), as well as the mediation role that online self-regulation (OSEL) plays in this regard. It is for this reason that this study will address the following research questions:

- RQ1: What are the factorial structures of Iranian (English as a Foreign Language) EFL learners' perceived supports, online self-regulation (OSEL), and online language learning approaches in the context of online language learning?
- RQ2: To what extent can Iranian EFL learners' perceived supports predict their online language learning approaches?
- RQ3: To what extent can language learners' online self-regulation mediate the correlation between their perceived supports and online language learning approaches?

2. Literature review

2.1. Theoretical framework

2.1.1. From student approach to learning (SAL) to Online Language Learning approaches (OLLA)

Marton and Säljö (1976), in their phenomenographic studies, established the SAL framework to explore higher education's (HIE) learning behaviors. Biggs et al. (2001) categorize this framework into deep and surface approaches. Deep learning involves students' intentions to have meaningful learning by integrating analysis and reflection, while the surface approach reflects students' attitudes toward reproducing content through rote learning.

By virtue of ICT's integration in education, based on SAL, Ellis and Bliuc (2015, 2019) proposed the SAOLT framework to explore tertiary learners' approaches in technology-based contexts. According to them, the deep approach to online learning alludes to the effective use of ICT to foster critical thinking, which in turn is linked to learners' willingness to reconsider and cross-reference various ideas. They asserted learners' limited use of ICT to minimize work and prevent the development of an effective online presence as a surface-level approach to online learning. There is no doubt that ICT has been an integral part of educational systems in recent years, and it is being increasingly utilized by learners in the academic sphere (Onyekwere & Enamul Hoquei, 2023). In this regard, Ellis and Bliuc (2019) recommended exploring students' experience in online learning environments and how it relates to other factors. Therefore, the researchers followed this recommendation and chose this theoretical framework to examine language learners' experiences within their psychological and contextual factors in an OLL environment. As a result, the researchers define a deep approach to online language learning as one in which language learners effectively use online language learning environments to meaningfully acquire language skills, subskills, and critical thinking related to language learning, leading to their willingness to continue language learning there. On the other hand, the surface approach refers to the limited use of online language learning by the language learners due to perceiving it as an ineffective context for acquiring target language skills and subskills and following rote language learning by simply memorizing the facts to pass the online language course.

2.1.2. Learners perceived support in online learning

The impression of perceived support can be defined as the belief that the assistance received during online learning facilitates academic success (Lee et al., 2011). Lee et al. (2011) developed a tri-categorical approach for investigating learners' perceived support for online instruction. Instructional support (IS) relates to course instructors' guidance, inclusive of outlined course objectives, appropriate learning resources, and prompt feedback from the educator, serving as the cognitive function. Peer support (PS), contributing to cognitive and affective aspects, involves students' mutual assistance to one another during their learning process regarding academic and non-academic difficulties. Technical support (TS) serves as systemic support, alluding to the assistance provided to learners' efforts to achieve a stable online learning process. The tri-phenomenal perspective of this framework enables us to explore how technical, pedagogical, and contextual supports influence language learners' approaches to OLLs. Thus, we selected this theoretical framework to measure language learners' perceived support in OLL.

2.1.3. Learners' online self-regulation in online language learning

Second Language Acquisition (SLA) has drawn considerable attention to the concept of self-regulation, derived from educational psychology, since learners with high self-regulatory capacity can manage their strategic learning and achieve goals in SLA contexts. Although there are a variety of definitions for self-regulation, it is widely recognized as a multi-dimensional and process-oriented process (Dai, 2024;

Dornyei & Ryan, 2015; Li et al., 2024; Rahimi et al., in press; Rahimi & Cheraghi, 2022; Zimmerman & Kitsantas, 2014). Additionally, it constitutes a critical psychological, behavioral, and cognitive component of language learners' complex dynamic systems in SLA (Freeborn et al., 2022; Larsen-Freeman & Cameron, 2008; Mercer, 2018; Oxford, 2016a, 2016b; Rahimi et al., in press). As defined by Zimmerman (2000), self-regulation refers to self-derive thinking, feelings, and activities that are planned accordingly and tailored to personal goals and in response to the rapid growth of online learning, which requires self-directed learners, Barnard et al. (2009) designed the Online Self-Regulated Learning Questionnaire (OSLQ) to examine learners' online self-regulation by considering six factors, namely goal-setting, time-management, task strategies, environment-structuring, help-seeking, and self-evaluation. While a significant amount of research has been conducted on online self-regulation (OSEL) and technology-supported self-regulation within the field of education (Hong et al., 2021; Li et al., 2020), there is still a limited number of studies exploring English learners' self-regulation using technology (Rahimi & Cheraghi, 2022; Rahimi et al., in press; Dai, 2024). The majority of current SLA research has been conducted among college students (e.g., Altok et al., 2019; Chen & Hsu, 2020). Research on secondary English learners' self-regulated learning is limited (Bai & Wang, 2021). Furthermore, most of these studies examined OSEL as a predictor or outcome variable; however, its role as a mediator has not been examined. Due to these gaps, we selected four constructs of OSEL as mediator variables, which the researchers operationalized as follows:

- Goal setting: Language learners' plans and objects of learning English online.
- Help-seeking: Language learners seek assistance in online language learning from peers and teachers.
- Time-management: Language learners set aside specific time and schedules for online English language learning.
- Self-evaluation: Assessment of language learners' progress in online language learning based on their self-assessment.

2.2. Hypotheses development

There has been empirical evidence that SAL has been affected by several factors and that research into these factors has primarily focused on two areas. First, environmental factors have been reported in previous studies. Various studies have shown that deep learning occurs in an environment accommodating clear learning objectives, organized learning activities, and relevance to professional practice (Englund et al., 2022; Eseadi, 2023; Ludke, 2016; Rahimi, 2024). According to recent studies, learners' support, including technical, peer, and instructional, was among the primary interventions of learners' approaches in both online and traditional learning contexts. For clarification, Rahimi (2024), in his study on mitigating the Language Massive Open Online Course (LMOOC) attrition rate, reported that both instructional and peer support of these online platforms shaped language learners' deep approach to LMOOC, which might culminate in persisting learners in this context. As a congruent study, Han and Geng (2023) found that perceived instructional support positively predicted learners' deep and negative surface approach to remote education, and technical support and peer support indirectly shaped learners' deep approach to remote education during the recent outbreak. As for traditional learning environments, Wang et al. (2024) reported that high school teachers' immediacy and autonomy support, including both verbal and nonverbal feedback, predicted junior high school learners' deep approach. Moreover, Englund et al. (2022) found that the control learning environment, which included the course context, the teaching and assessment content, the relationship between the student and staff, as well as the student culture in the classroom, was attributed to positively shaping learners' deep and negative approach to their learning classrooms.

There have also been other scholarly studies in the field of language

education that reported that learners' perceived teachers' support shaped their engagement with the language course (Hejazi & Sadoughi, 2022; Qiu, 2022). Notably, language teachers who provide students with clear learning objectives, immediate feedback, and collaborative activities with their peers lead students to greater schooling engagement (Lo, 2023). The findings of other empirical studies in the field of language teaching indicated that learners' perceptions of the support they receive from their teachers predicted their engagement with the subject matter (Hejazi & Sadoughi, 2022). A significant finding was that language teachers who provide their students with explicit learning objectives, immediate feedback, and collaborative activities with their peers increase students' engagement with their language course (Lo, 2023); however, its role in shaping language learners' approaches to online language learning has yet to be explored. In addition, studies have shown that learners' approaches are adversely affected by inadequate support. To clarify, the learners' intention to adopt the surface approach was shaped by the lack of contextual support, particularly peer one, resulting from the teacher-centered classroom (Mork et al., 2022). The lack of pedagogical support, such as course alignment and sequence (Lahdenperä et al., 2021), and limited ICT use also resulted in shaping learners' surface approach (Ellis & Bliuc, 2019). Taking all those insights from relevant literature into account, the following hypotheses were formulated:

H1. Instructional support positively predicts language learners' deep approach (H1a) and negatively predicts surface approach (H1b).

H2. Technical support positively predicts language learners' deep approach (H2a) and negatively predicts surface approach (H2b).

H3. Peer support positively predicts language learners' deep approach (H3a) and negatively predicts surface approach (H3b).

Studies also explored psychological factors that were found to be mediators between learners' perceived support and their learning approach, particularly in relation to self-efficacy (Ellis & Bliuc, 2019; Han & Geng, 2023), enjoyment (Han & Geng, 2023), intrinsic and extrinsic motivation (Lu et al., 2021), or their L2 self-identities (Rahimi, 2024). As a clarification, Rahimi (2024), in his study on exploring the role of language learners' L2 motivational self-system in shaping their deep and surface approach to LMOOC, reported that both learners' ideal future self (learning language for their personal future image) and ought to L2-self (learning language to get an LMOOC certificate) complementarily mediated the correlation between learners' perceived supports in LMOOC and their approaches to it. In another study, Han and Geng (2023) found that learners' emotions and self-efficacy positively mediated the relationship between their perceived supports and deep and negatively mediated its relationship with surface approaches to remote learning.

By reviewing recent SAL studies, psychological factors were found to be both predictors and mediators in shaping learners' surface and deep approaches to the target learning context. The existence of evidence of these psychological factors has led to a question regarding the role of cognitive and behavioral factors mediating these effects, such as OSEL. It is noteworthy, however, that no prior survey has explored this issue, particularly in online and language-learning contexts. The gap in our understanding of learners' SAL suggests that further research is needed in this area.

As defined by Rahimi and Cheraghi (2022), self-regulation is the result of the transition between language learners' ideal self-images and their perceived obligations to pass their academic criteria and meet others' expectations in online learning contexts, which is crucial for self-directed language learning and influences learners' language learning behaviors. Recent systematic studies have highlighted the effectiveness of self-regulation in enabling learners to achieve higher course performance and achievement (Eggers et al., 2021; Nan Cenka et al., 2022). According to Saadati et al. (2021), online self-regulation is influenced by social factors such as peer collaboration, especially when students

receive peer assistance from their classmates. This was proved by recent findings, which reported a high degree of correlation between peer support and learners' self-regulation strategies, including task strategies and help-seeking (Shin & Song, 2022; Rahimi & Cheraghi, 2022). Further, Wolters and Brady (2020) reported that time management was the most critical component of self-regulation that students manage to determine how long they should spend on activities required for academic success. Despite this, recent SAL studies have found that learners tend to have a surface approach to their educational settings due to their inability to manage their academic schedules (Beauchamp & Monk, 2022), as well as a lack of clear learning objectives (Aydiner-Uygun, 2020; Lindblom-Ylänne et al., 2018), which may be a consequence of poor cognitive and behavioral management, particularly self-regulation. This led us to explore its role as a mediator between language learners' perceived support and their approaches to online language learning. Accordingly, the following research hypotheses developed by the researchers are as follows:

H4. Goal-setting significantly mediated the relationship between language learners' instructional support and their deep (H4a) and surface approaches (H4b).

H5. Goal-setting significantly mediated the relationship between language learners' peer support and their deep (H5a) and surface approaches (H5b).

H6. Goal-setting significantly mediated the relationship between language learners' technical support and their deep (H6a) and surface approaches (H6b).

H7. Help-seeking significantly mediated the relationship between language learners' instructional support and their deep (H7a) and surface approaches (H7b).

H8. Help-seeking significantly mediated the relationship between language learners' peer support and their deep (H8a) and surface approaches (H8b).

H9. Help-seeking significantly mediated the relationship between language learners' technical supports and their deep (H9a) and surface approaches (H9b).

H10. Time-management significantly mediated the relationship between language learners' instructional support and their deep (H10a) and surface approaches (H10b).

H11. Time-management significantly mediated the relationship between language learners' peer support and their deep (H11a) and surface approaches (H11b).

H12. Time-management significantly mediated the relationship between language learners' technical support and their deep (H12a) and surface approaches (H12b).

H13. Self-evaluation significantly mediated the relationship between language learners' instructional support and their deep (H13a) and surface approaches (H13b).

H14. Self-evaluation significantly mediated the relationship between language learners' peer support and their deep (H14a) and surface approaches (H14b).

H15. Self-evaluation significantly mediated the relationship between language learners' technical support and their deep (H15a) and surface approaches (H15b).

2.3. Literature gap and study aim

The present study fills substantial gaps in the literature. A significant point of this study is that it is the first study that applies SAT to online language learning and psycholinguistics. Indeed, to the best of the researchers' knowledge, previous studies integrated SAL with mathematics

(Lahdenperä et al., 2021), food science (Schmidt, 2020), and STEM education (Han & Geng, 2023; Schmidt, 2020; Zakariya et al., 2020), while little attention has been paid to humanistic fields, particularly English language learning. Additionally, the factorial structure of SAL in English language teaching, particularly in online and Iranian EFL contexts, has yet to be revealed. In recent studies, how technical, pedagogical, and technological support affects language learners' engagement with OLL has been studied (Dousti & Amirian, 2022; Lyu & Lai, 2022). Thus, learners' approaches to online language learning need to be taken into account.

A more pertinent consideration is to examine the role of support in determining how online language learning approaches are developed. At this point, a better understanding of behavioral engagement, such as OSEL, in this context is required, as previous literature contributions have already examined the role of motivation, emotion, and enjoyment in shaping students' approaches to online learning (Ellis & Bliuc, 2019; Han & Geng, 2023; Lu et al., 2021; Rahimi, 2024). Accordingly, this study evaluates the factorial structure of SAL in relation to language learning and introduces a new conceptual model to the language learning literature and psycholinguistics. More importantly, the process of learning a second language is dynamic, meaning that language learners need to use a variety of cognitive, affective (e.g., emotion), and behavioral factors (e.g., self-regulation) together, which are interdependent and interrelated in a complex dynamic system in SLA (Freeborn et al., 2022; Larsen-Freeman & Cameron, 2008; Mercer, 2018; Oxford, 2016a, 2016b). To the best of our knowledge, the complex dynamic system has not considered students' deep and surface approaches as behavioral factors, nor explored their relationship with cognitive, affective, and behavioral factors in language learning. The gap in our understanding of learners' psycholinguistics suggests that further research is needed in this area. Accordingly, the researcher developed the following model in light of the literature gaps and the study objective. Fig. 1 shows a model hypothesis.

3. Method

3.1. Study design

Due to the study's objective to explore the complex correlation between language learners' perceived supports, language learning approaches, and their OSEL as mediator or moderator variables, thus the researchers selected a quantitative design in the form of a correlational one. It is defined as examining the relationships between two variables (or more) without controlling or manipulating any of them (Creswell, 2014). Structural equation modeling (SEM) is one of the most well-known approaches to correlational design, which analyzes the complex structural relationships between latent variables in conjunction with error estimation, resulting in a valid assessment of the correlational model. It is classified as either confirmatory or exploratory, where in the first approach, a theory is replicated or established in another domain, or a pre-specified relationship is confirmed (Mai et al., 2018; Ringle et al., 2018; Sarstedt et al., 2016). While, in the exploratory domain, the researcher develops the model based on the lack of evidence, or on connecting ideas in an effort to gain a deeper understanding of the phenomenon (Mai et al., 2018; Ringle et al., 2018; Sarstedt et al., 2016). As reviewed above the relationship between language learners' perceived support, and their approaches to online language learning, and the mediator role of OSEL has not been covered was remained unclear, accordingly the researcher selected the exploratory approach of this design in the current study.

3.2. Participants

A study was conducted in three Iranian cities, including Quchan, Mashhad, and Sabzevar, which involved eleven public and private high schools. Researchers first got authorization from the educational

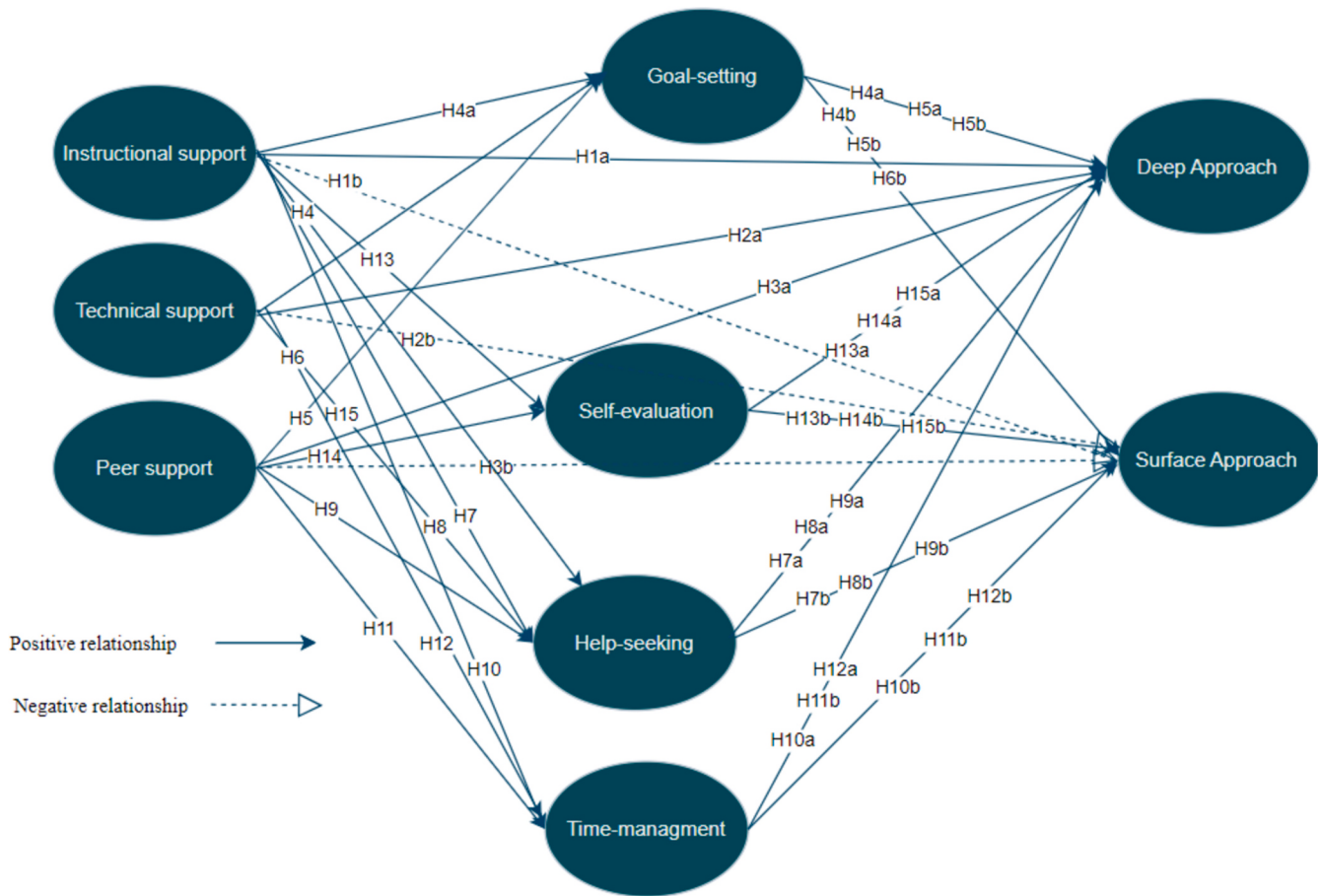


Fig. 1.. Study model hypothesize.

departments of each city and school in order to collect the study data. They also claimed that participants' personal information, along with their consent, would not be disclosed in any way during the research procedure. Then, the survey questions were translated into the participants' first language by two expert translators. In order to maintain a large sample size and ensure that each participant had an equal and independent chance to be included in the analysis, the researchers chose a simple non-probability sampling method (Ary et al., 2009). To do so, an online questionnaire was developed and sent to their language teachers for posting on their online platforms, where participants were asked to participate voluntarily. These were Iranian EFL students who were learning English online in their high schools. They advanced their general English course using platforms such as Adobe Connect, their school's learning management system (LMS), and Sky Room. From October 2021 to March 2022, participants voluntarily completed online questionnaires. Nine incomplete questionnaires were eliminated after receiving them from the participants. Finally, 686 participants answered the survey, consisting of 442 females and 244 males. Most of them were juniors, followed by second- and first-year students, with an average age of 17.1 years. In terms of experience with online language learning, 152 had less than two years of experience, and 534 had two to three years. Table 1 represents the participants' demographic information.

3.3. Instruments

Four parts of the questionnaire were included in the survey. In the first part, participants' demographic information was gathered, including their age, gender, and number of years of education. The remaining parts of the study were used to measure the study's proposed models on a 5-point Likert scale ranging from 1 (strongly disagree) to 5

Table 1
Participants' demographic information.

		N	%
Gender	Male	244	35.6
	Female	442	64.4
Level	Years		
	Freshmen	96	14 %
	sophomore	232	33.8 %
Average age	junior	358	52.2 %
	17.1		
Language	Years		
	1–3	270	21.1
Learning	3–4	17	31.0
	4<	399	47.8
Experience	Years		
	<2	152	22.2
	2–3	534	77.8.

(strongly agree). As part of the second part, the researchers used indicators adapted from Lee et al. (2011), which comprise 11 items consisting of IS (e.g., "Our online English course provides relevant language-learning material"), TS (e.g., "I knew where to ask for help when I had technical issues in our online English language class"), PS ("There were many opportunities to interact with peers in our online English class"). It was the third block that involved the measurement of participants' OSEL and four factors of help-seeking (HS) ("I share my language learning problems with my classmates in our online classrooms so we know what we are dealing with and how to solve our problems"), goal-setting (GS) ("I adhere to a high standard for my online English course"), self-evaluation (SE) ("I interact with my classmates to discover what is it

that I am learning that is different from what they are learning in our online English course “), and time-management (TM) (“I devote extra studying time to learning English online because it needs more time”), Environment structuring (ES) (“I choose a good location for learning English online to avoid too much distraction), and task strategies (TSG) “I prepare my questions before our online language classroom” selected from [Zheng et al.'s \(2018\)](#), and [Rahimi and Cheraghi's \(2022\)](#) OSEL questionnaire with eighteen items. Finally, the last part, a seven-item questionnaire, was adapted to measure learners' online learning approaches. It was adapted from [Ellis and Bliuc's \(2015, 2019\)](#) SAOLT questionnaire at it included both a Deep approach (“I try to use online language learning to communicate with other participants to test my language learning development”) and surface approach (“I do not find learning English online helps me to learn English more deeply”). [Table 2](#) displays the latent variables' descriptive statistics, which are displayed in all average mean scores above 2, except for TS. Additionally, the distribution of the data for all variables is non-normal.

3.4. Data analysis

As per the study's purpose, to validate the factorial structure of SAL in English language learning, particularly in online environments, and provide a new conceptual model of it in the Iranian EFL context, the researchers applied variance-based structural equation modeling to evaluate the study's proposed model since partial least squares (PLS-SEM) does not exhibit sensitivity to multivariate normality ([Sarstedt et al., 2020](#)); it is also considered a suitable method for predicting and evaluating the collinearity between latent variables in a complex model ([Hair et al., 2012](#)). Having had regression-based ordinary least squares (OLS), PLS-SEM is also suitable for the development of exploratory models ([Hair Jr. et al., 2013](#)) such as the present study. Compared with a covariance-based structural equation model (CB-SEM), the composite-based model performs superficially in estimating the mediation analysis ([Sarstedt et al., 2020](#)). As a result, the researchers evaluated the data from the study using the PLS-SEM (4.1.0.9) package.

4. Result

4.1. Measurement model

The measurement model of the PLS-SEM is intended to calculate the reliability and validity of the variables. All variables except ES and TS exhibited adequate values for both internal reliability and convergent validity, as represented by [Table 3](#). Accordingly, their Cronbach alpha coefficients exceeded the recommended value of 0.7, and composite reliabilities were higher than 0.5 ([Hair et al., 2021](#)). As part of the validity testing, the researchers comply with [Hair et al.'s \(2021\)](#) recommendation to measure convergent and discriminant validity. The

Table 2
Descriptive statistics of latent variables in study.

Kolmogorov-Smirnov ^a		Variance statistic	Standard deviation	Mean	Variables
sig	statistics				
0	0.117	0.81	0.9	2.77	TS
0	0.107	0.93	0.96	3.28	IS
0	0.11	0.62	0.79	3.37	PS
0	0.099	0.55	0.74	3.42	HS
0	0.131	0.42	0.65	3.39	GS
0	0.107	0.57	0.75	3.38	SE
0	0.127	0.41	0.64	3.37	DA
0	0.121	0.46	0.68	3.37	SA
0	0.13	0.6	0.77	3.33	TM
0	0.11	0.34	0.56	2.15	ES
0	0.114	0.42	0.66	2.17	TSG

^a . Lilliefors significance correction.

Table 3
Result of the internal reliability and convergent validity.

Variable	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
DA	0.707	0.711	0.820	0.533
GS	0.710	0.711	0.821	0.535
HS	0.719	0.786	0.843	0.649
IS	0.881	0.889	0.926	0.808
PS	0.824	0.846	0.887	0.667
SA	0.725	0.794	0.845	0.651
SE	0.729	0.741	0.849	0.654
TM	0.852	0.854	0.910	0.771
TS	0.898	0.908	0.936	0.830

Note: Cronbach alpha and composite alpha should both be >0.07. Average variance extracted (AVE) should exceed 0.05.

average variance extracted (AVE) was tested for convergent validity and was found to be >0.5 ([Fornell & Larcker, 1981](#)) except for environment structuring and task strategies; accordingly, the researchers did not have any choice but to remove these two latent variables from the study.

As a means of estimating discriminant validity, [Fornell and Larker's \(1981\)](#) criteria were applied. According to them, $\sqrt{A}$ of each variable should be higher than its correlation with other variables. [Table 4](#) illustrates the result of the discriminant validity.

A heterotrait-monotrait ratio (HTMT) method, proposed by [Henseler et al. \(2015\)](#), was used to investigate discriminant validity. For conceptually similar constructs, an HTMT threshold of 0.85 is generally preferred. [Table 5](#) shows that all HTMT values are comfortably below the 0.85 threshold.

In order to evaluate the common method, bias we applied variance inflation factors (VIF) in both outer, and inner model, as you can see all the factors were obtained below 0.5 ([Hair et al., 2021](#)), which shows that any problem regarding the collinearity as shown in [Tables 6, and 7](#). We also applied the Harman's Single Factor test, which yielded a score of 28.50, below the recommended threshold of 50.

4.2. The structural model

For the purpose of evaluating the outer model of the PLS-SEM, path coefficient, direct analysis, mediation analysis, variance inflation factor, coefficient of determination (R^2), and predictive accuracy were applied ([Hair et al., 2021](#)), Stone-Geisser values, Standardized Root Mean Square Residuals (SRMR), and Stone Gissier (Q^2 ; [Henseler et al., 2016](#)), and Goodness of Fit (GOF, [Tenenhaus et al., 2004](#)) were also applied.

Our mediation analysis was tested using [Baron and Kenny's \(1986\)](#) method. In their view, the independent variable (learners' perceived support) must significantly predict the dependent variable (learners' learning approaches). Additionally, the third variable hypothesized as a mediator (online self-regulation) must also be significantly correlated with the target variable. A complete mediation occurs when the independent variable no longer influences the dependent variable after the mediator has been controlled and all of the above conditions have been met. Partial mediation occurs when the independent variable's influence on the dependent variable is reduced after the mediator is controlled ([Baron & Kenny, 1986](#)).

As a result of an analysis of the direct path coefficients of the structural model, which represent the relationships only among the language learners' perceived supports, and their learning approaches were evaluated. Unfortunately, H3a ($\beta = 0.010, p > 0.05; t < 1.96$), and H3b ($\beta = 0.033, p > 0.05; t < 1.96$), H5b ($\beta = -0.19, p > 0.88$), did not support the study hypotheses, as either their p -values were above 0.05 or their t -values were below 1.96 ([Hair et al., 2021](#)). It is also worth noting that, as shown in [Table 8](#), H1a ($\beta = 0.101, p < 0.05; t > 1.96$) and H2a ($\beta = 0.287, p < 0.05; t > 1.96$) were supported, while H1b ($\beta = 0.068, p < 0.05; t > 1.96$), and H2b ($\beta = 0.163, p < 0.05; t > 1.96$) were

Table 4
Result of the discriminant validity.

	DA	GS	HS	IS	PS	SA	SE	TM	TS
DA	0.730								
GS	0.442	0.731							
HS	0.442	0.464	0.806						
IS	0.457	0.295	0.226	0.899					
PS	0.554	0.464	0.429	0.464	0.816				
SA	0.401	0.263	0.229	0.354	0.501	0.807			
SE	0.539	0.561	0.551	0.384	0.494	0.314	0.808		
TM	0.433	0.364	0.303	0.265	0.332	0.430	0.470	0.878	
TS	0.417	0.194	0.173	0.381	0.463	0.476	0.266	0.258	0.911

Note: The root of the average variance extracted of each variable should only have high correlation with that variable, and exceed 0.5.

Table 5
Heterotrait-monotrait ratio (HTMT) – Matrix.

	DA	GS	HS	IS	PS	SA	SE	TM	TS
DA									
GS	0.623								
HS	0.607	0.644							
IS	0.580	0.371	0.279						
PS	0.724	0.606	0.557	0.544					
SA	0.563	0.361	0.299	0.447	0.659				
SE	0.751	0.777	0.756	0.475	0.637	0.434			
TM	0.557	0.467	0.378	0.304	0.395	0.531	0.597		
TS	0.522	0.238	0.201	0.429	0.544	0.588	0.327	0.292	

Table 6
Collinearity statistics (VIF) of outer model.

Variable	VIF
DA1	1.796
DA2	1.911
DA3	1.795
DA4	1.754
GS1	1.824
GS2	1.874
GS3	1.829
GS4	1.789
HS1	2.157
HS2	2.032
HS3	1.165
IS2	2.512
IS3	2.527
PS1	2.458
PS2	2.449
PS3	2.603
PS4	1.202
SA1	1.189
SA2	1.955
SA3	2.098
SE1	1.200
SE2	1.944
SE3	1.877
TM1	2.206
TM2	2.220
TM3	1.917
TS1	2.484
TS2	3.135
TS3	2.860
IS1	2.340

rejected.

Before evaluating the mediation analysis, we evaluate the significant correlations between OSEL and language learners' approaches to OLL, as well as language learners' perceived supports, and their OSEL. As shown in Table 9, except GS - > SA, HS - > SA, and SE - > SA, TS - > SE, TS - > HS, TS - > GS all of them had significant correlations with each other's.

One of the main objectives of the study is to explore the role of online self-regulation as the mediator variable. Therefore, we performed a bootstrap analysis on 5000 sub-samples to investigate the mediation

Table 7
Collinearity statistics (VIF) of inner model.

Variable	VIF
GS - > DA	1.561
GS - > SA	1.561
HS - > DA	1.513
HS - > SA	1.513
IS - > GS	1.334
IS - > HS	1.334
IS - > SE	1.334
IS - > TM	1.334
PS - > GS	1.451
PS - > HS	1.451
PS - > SE	1.451
PS - > TM	1.451
SE - > DA	1.914
SE - > SA	1.914
TM - > DA	1.309
TM - > SA	1.309
TS - > GS	1.333
TS - > HS	1.333
TS - > SE	1.333
TS - > TM	1.333

Table 8
Result of the indirect analysis.

Hypotheses	Path	β	Sample mean (M)	Standard deviation (STDEV)	T statistics	P values
H1a	IS- > DA	0.101	0.101	0.025	3.995	0.000
H1b	IS- > SA	0.068	0.068	0.020	3.479	0.001
H2a	PS- > DA	0.287	0.290	0.029	9.846	0.000
H2b	PS- > SA	0.163	0.165	0.029	5.569	0.000
H3a	TS- > DA	0.010	0.011	0.023	0.421	0.673
H3b	TS- > SA	0.033	0.035	0.019	1.735	0.083

Note: The t-value should be >1.96. The p-value should be <0.05.

Table 9

The correlation between language learners' OSEL, and their approaches to online language learning.

Paths	β	T statistics	P values
GS - > DA	0.136	3.285	0.001
GS - > SA	0.066	1.531	0.126
HS - > DA	0.166	4.650	0.000
HS - > SA	0.044	1.040	0.298
SE - > DA	0.276	6.533	0.000
SE - > SA	0.088	1.713	0.087
TM - > DA	0.204	5.056	0.000
TM - > SA	0.351	9.102	0.000
IS - > HS	0.043	0.974	0.330
IS - > SE	0.196	5.486	0.000
IS - > TM	0.118	2.940	0.003
PS - > GS	0.436	10.286	0.000
PS - > HS	0.428	10.320	0.000
PS - > SE	0.401	10.347	0.000
PS - > TM	0.227	4.618	0.000
TS - > GS	-0.051	1.340	0.180
TS - > HS	-0.042	1.009	0.313
TS - > SE	0.006	0.154	0.878
TS - > TM	0.107	2.595	0.009

effects of online self-regulation. In light of this, the indirect correlation analysis showed that H4a (IS - > GS - > DA; $\beta = 0.015$), H10a (IS - > TM - > DA; $\beta = 0.024$), H10b (PS - > TM - > DA; $\beta = 0.024$), H11a (PS - > TM - > DA; $\beta = 0.046$), H12a (TS - > TM - > DA; $\beta = 0.22$), H13a (IS - > SE - > DA; $\beta = 0.054$); and H14a (PS - > SE - > DA; $\beta = 0.110$) were accepted and all of them acted as complementary mediator variable as defined by Baron and Kenny (1986). While H10b (IS - > TM - > SA; $\beta = 0.042$), H11b (PS - > TM - > SA; $\beta = 0.080$), H12b (TS - > TM - > SA; $\beta = 0.038$), and H14b (PS - > SE - > SA; $\beta = 0.035$) were rejected, since the time-management acted as a full mediator (Baron & Kenny, 1986). Neither the t-value nor the p-value of any of the remaining hypotheses was significant and thus they were not supported. Table 10 displays the mediation analysis result. A summary of the study hypotheses results is presented in Table 11.

The coefficient of determination (R^2) is the most common metric used to determine the predictive power of structural models (Hair et al., 2011). For both the deep and surface approaches, the combined effect of perceived support and OSEL accounted for 0.37 % and 0.20 %, respectively. Chin (1998) stated that values of 0.19, 0.33, and 0.67 are considered weak, medium, and strong, respectively.

Further, the model's predictive accuracy was evaluated through a Stone-Geisser or Q^2 test. As noted by Hair et al. (2011), values above zero indicate that the model is adequate in terms of predictive relevance, which is the case illustrated by Table 12.

Lastly, to evaluate the goodness of fit for the structural model, the researchers applied both SRMR, which was offered by Henseler et al. (2016), GOF, which was proposed by Tenenhaus et al. (2004). The primary reason for using both metrics simultaneously is that scholars have varying opinions as to which method is appropriate for fitting the overall model (Henseler & Sarstedt, 2012). GOF parameters of 0.01, 0.25, and 0.36 represent weak, medium, and strong values, respectively (Wetzels & van Oppen., 2009), and SRMR of <0.08 is recommended (Hu & Bentler, 1999). Therefore, we calculated the GOF by multiplying the average values of all variables A by the average values of all coefficients of determination (R^2), then taking the square root of the result. Moreover, the SRMR reached substantial and significant levels. Fig. 2, and 3 show the structural model, the standard path coefficients, the t-values, and the final model with factor loadings.

5. Discussion

5.1. Online language learning approaches (OLLA)

Based on the results of the reflective model, the SAOLT framework

Table 10

Result of the serial mediation analysis.

Hypotheses	Paths	β	2.5 %	97.5 %	T statistics	P values
H4a	IS- > GS- > DA	0.015	0.003	0.032	2.080	0.038
H4b	IS- > GS- > SA	0.007	-0.002	0.020	1.300	0.194
H5a	PS- > GS- > DA	0.059	0.022	0.102	2.889	0.004
H5b	PS- > GS- > SA	0.029	-0.007	0.071	1.453	0.146
H6a	TS- > GS- > DA	-0.007	-0.018	0.004	1.266	0.206
H6b	TS- > GS- > SA	-0.003	-0.010	0.003	1.013	0.311
H7a	IS- > HS- > DA	0.007	-0.007	0.025	0.900	0.368
H7b	IS- > HS- > SA	0.002	-0.003	0.010	0.584	0.559
H8a	PS- > HS- > DA	0.071	0.040	0.107	4.117	0.000
H8b	PS- > HS- > SA	0.019	-0.016	0.057	1.016	0.310
H9a	TS- > HS- > DA	-0.007	-0.021	0.007	0.989	0.323
H9b	TS- > HS- > SA	-0.002	-0.008	0.004	0.662	0.508
H10a	IS- > TM- > DA	0.024	0.007	0.048	2.299	0.022
H10b	IS- > TM- > SA	0.042	0.014	0.072	2.801	0.005
H11a	PS- > TM- > DA	0.046	0.022	0.079	3.202	0.001
H11b	PS- > TM- > SA	0.080	0.043	0.123	3.886	0.000
H12a	TS- > TM- > DA	0.022	0.004	0.045	2.036	0.042
H12b	TS- > TM- > SA	0.038	0.009	0.073	2.292	0.022
H13a	IS- > SE- > DA	0.054	0.030	0.082	4.066	0.000
H13b	IS- > SE- > SA	0.017	-0.003	0.039	1.651	0.099
H14a	PS- > SE- > DA	0.110	0.073	0.153	5.386	0.000
H14b	PS- > SE- > SA	0.035	-0.006	0.080	1.634	0.102
H15a	TS- > SE- > DA	0.002	-0.018	0.023	0.152	0.880
H15b	TS- > SE- > SA	0.001	-0.006	0.010	0.130	0.896

Note: With 5000 subsamples, 97.5 % confidence intervals with a bias correction for both upper and lower bias, the indirect effects are estimated.

was validated in the field of English language teaching, particularly in the Iranian EFL context. This result adds to the emerging literature on SAL, educational technology, as well as online language learning, since recent studies validated the effectiveness of SAOLT in mathematics (Lahdenperä et al., 2021), food science (Schmidt, 2020), and STEM education (Han & Geng, 2023; Smarandache et al., 2022; Zakariya et al., 2020), while this study validates its effectiveness in the field of online language learning. Thus, the first phase of the study introduced a new conceptual framework of SAOLT in English language learning, online language learning approaches (OLLA). Moreover, this phase of the present study highlighted that the SAL framework is not primarily tailored to tertiary education which has been applied by previous studies (Ellis & Bliuc, 2015, 2019; Han & Geng, 2023; Pintrich, 2004) but can also be applied to secondary education.

5.2. Relationship between learners' support and their approaches

The result of reflective model showed that IS positively predicted

Table 11
Summary results of the study hypothesize.

Hypotheses	Paths	Result
H1a	IS- > DA	Confirmed
H1b	IS- > SA	Rejected
H2a	PS- > DA	Confirmed
H2b	PS- > SA	Rejected
H3a	TS- > DA	Rejected
H3b	TS- > SA	Rejected
H4a	IS- > GS- > DA	Confirmed
H4b	IS- > GS- > SA	Not supported
H5a	PS- > GS- > DA	Confirmed
H5b	PS- > GS- > SA	Not supported
H6a	TS- > GS- > DA	Not supported
H6b	TS- > GS- > SA	Not supported
H7a	IS- > HS- > DA	Not supported
H7b	IS- > HS- > SA	Not supported
H8a	PS- > HS- > DA	Confirmed
H8b	PS- > HS- > SA	Not supported
H9a	TS- > HS- > DA	Not supported
H9b	TS- > HS- > SA	Not supported
H10a	IS- > TM- > DA	Confirmed
H10b	IS- > TM- > SA	Rejected
H11a	PS- > TM- > DA	Confirmed
H11b	PS- > TM- > SA	Rejected
H12a	TS- > TM- > DA	Confirmed
H12b	TS- > TM- > SA	Rejected
H13a	IS- > SE- > DA	Confirmed
H13b	IS- > SE- > SA	Not supported
H14a	PS- > SE- > DA	Confirmed
H14b	PS- > SE- > SA	Rejected
H15a	TS- > SE- > DA	Not supported
H15b	TS- > SE- > SA	Not supported

Table 12
Structural model goodness of fit.

R ²	Q ²	Variables
0.370	0.257	DA
0.206	0.273	SA
0.226	0.121	GS
0.186	0.128	HS
0.271	0.184	SE
0.134	0.093	TM
GOF = $\sqrt{\text{Communalities} \times R^2} = \sqrt{0.820 \times 0.232} = 0.436$		
SRMR = 0.058		

Note: R²: coefficient of determination. Q²: Stone-Geisser; GOF: goodness of fit; SRMR: standardized root mean square residual.

both deep ($\beta = 0.101, p < 0.001$) and surface ($\beta = 0.068, p < 0.001$) approaches, thus rejecting the null hypothesis (H1b). It follows that when learners are provided with explicit instructional goals, relevant materials, and prompt feedback, it is more likely that they will continue online language schooling aligned with a deep approach. IS also positively predicted learners' surface approach, and its shared variance exceeded the deep one, which was not expected and thus was ruled out (H1a). This finding is not analogous to those of previous studies reporting collinearity between learners' deep approach and instructional goals (Han & Geng, 2023; Rahimi, 2024; Smarandache et al., 2022). Possibly, this may be related to the learning process described by Meyer (2000) in his reflections on learning inventory. This researcher claimed that students who participated in theoretical courses exhibited a preference for a surface-based approach and continued studying complex material until they met their objectives, which was the case of the participants in the current study: these were Iranian learners of English who had theoretical courses in their online language syllabuses. This may have contributed to the misalignment between the study's results and those of other studies, since the studies conducted in other fields had practical bases, such as STEM (Han & Geng, 2023; Zakariya et al., 2020).

Complementary to this, previous studies reported that learners' specialization contributes to their preference for online learning approaches (Geitz et al., 2016; Smarandache et al., 2022). Paying attention to the type of materials used was crucial. As Smarandache et al. (2022) reported, a deep and surface approach comes from an interest-to-effort ratio, which indicates learners' preference to spend their time on intriguing topics and materials when they are involved in a deep approach, as opposed to taking part in engrossing topics and materials when they are applying a surface approach.

Discrepancies between language learners' goals and instructional support are also critical factors, as reported by Rahimi (2023), who found that Iranian EFL learners' diverse self-images and reasons to attended online language learning should be aligned with the support of educators, since many students learn English for various reasons, including: to immigrate, to fulfill academic criteria, or to become familiar with the target culture. It was concluded that instructors often fail to find the right balance between those motivations and the support they provide their students with. In light of these results, further research should be conducted to identify the role of support in language learners' approaches in our field. It also demonstrates an overestimation of self-report data, reflecting the instructional support and language learners' approaches to online learning (J.W. Creswell & Creswell, 2017).

Unexpectedly, the technical support could not predict any of the learners' approaches to online language learning. Therefore, a high level of equipment and skills was not related to EFL learners' meaningful online language and willingness to participate, which were related to their deep learning approach. This result echoes Han and Geng's (2023) assertion that there is no relationship between Chinese learners' technical support and online learning approaches. This also in line with Rahimi (2024) who reported that Iranian EFL learners' technical support did not have any correlations with their language learning approaches to LMOOC. This might.

The result concerning the third hypothesis was also interesting, as peer support positively predicted both SA ($\beta = 0.161, p < 0.001$) and DA ($\beta = 0.287; p < 0.001$), while rejecting H3b. Accordingly, peer assistance directly influenced the preference of individuals to maximize or minimize meaningful language learning, and their presence in this context. This is convergent with the observation made by Costantini et al. (2015) that network bandwidth and peer feedback significantly influenced students' preference for both approaches in learning. Interestingly, it had a higher shared variance with learners' deep approach as opposed to the surface one. The lack of body language, kinesthetic learning style, or supporting both skills and subskills in online language learning may explain why participants prefer to minimize their time and effort when learning in an online environment (Hajar & Manan, 2022). This also disagrees with recent studies claiming that peer support is associated with the emotional aspects of students rather than behavioral aspects (Han & Geng, 2023). This finding contradicts Han and Geng (2023), who reported that Chinese students' peer supports did not have any correlation with their deep and surface approaches to online learning. There is also a conflict between Rahimi's (2024) report and this study because he found that Iranian EFL learners' perceived peer support positively influenced their deep approach and negatively influenced their surface approach to LMOOCs. The difference between our results may be related to the open context features of LMOOCs in comparison with online language learning, as LMOOCs allow anyone, from anywhere, with diverse backgrounds to participate, and the learners are provided with much more support; however, our study context and online learning environment were restricted to local students, which might have contributed to this unexpected result.

5.3. The mediation role of online self-regulation and language learners' learning approaches

When it comes to the mediation role of OSEL factors between

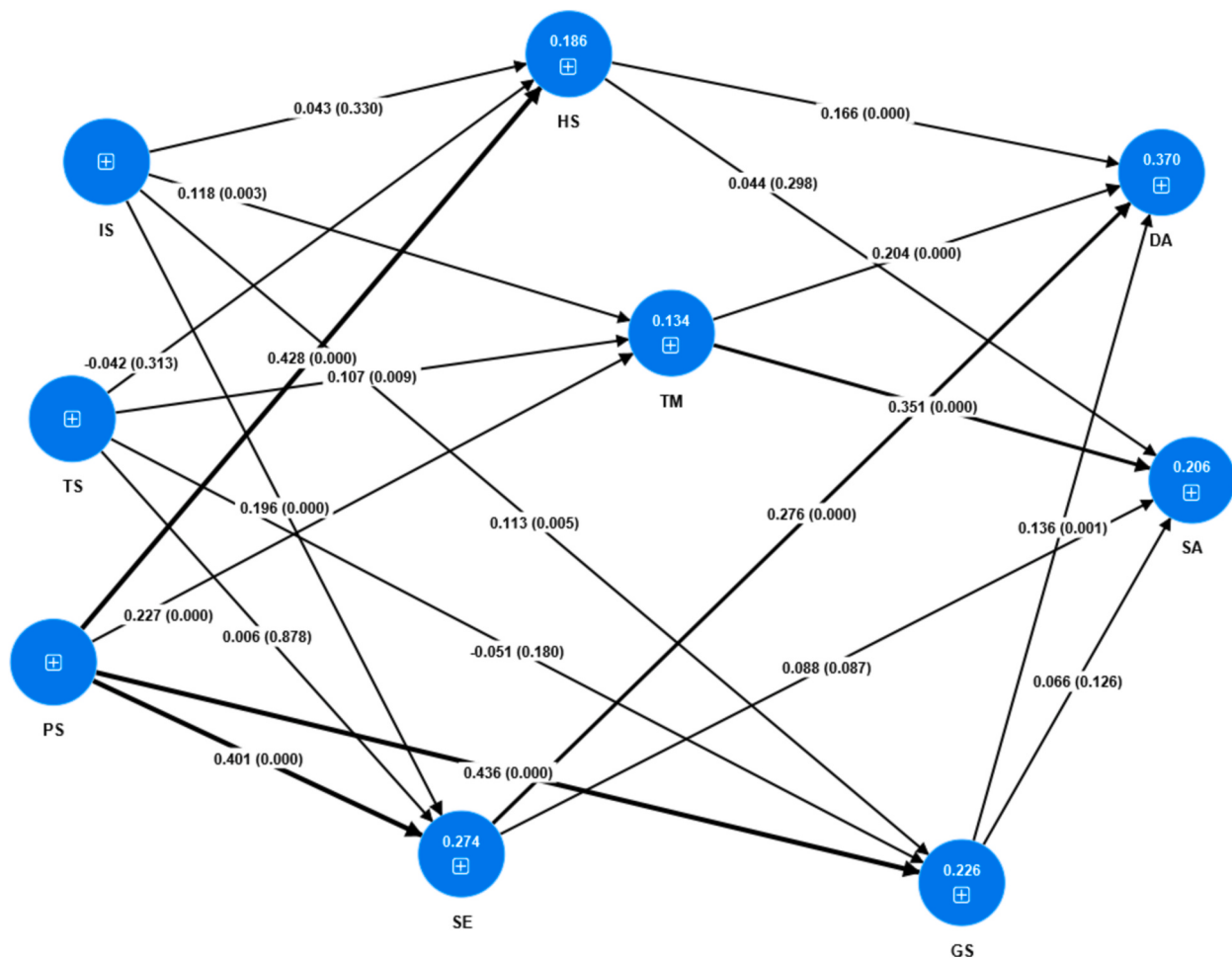


Fig. 2. Structural model relative value.

language learners' perceived support and their online language learning approaches, the bootstrap indirect analysis showed that online self-regulation was a significant moderator of these correlations because all perceived support positively correlated with both the deep and the surface approaches. In other words, they flipped the direction between language learners' perceived support, and their surface approach. However, when online self-regulation factors are considered as moderator variables in the relationships, the results revealed that language learners take a deeper approach to online language learning instead of a surface one, except in the case of time management. In this line, goal-setting (IS - > GS - > DA; $\beta = 0.015$), help-seeking (PS - > HS - > DA; $\beta = 0.071$), and self-evaluation (IS - > SE - > DA; $\beta = 0.110$, $p < 0.001$) significantly mediated learners' deep approach to online learning. There may be a context-dependent explanation for these results, as recent studies have found that Asian students were more likely to self-regulate in an online digital environment than their counterparts in European countries (Chen et al., 2021; Rahimi & Cheraghi, 2022).

Result also showed that time management positively mediated the relationship between language learners' perceived support and their approaches, particularly their surface one, thus rejecting H10b, H11b, and H12b. In this regard, learners who are able to manage their online language learning schedules may choose to meaningfully or limit their use of online language learning. A major factor could be learners' attitudes toward OL, whether they perceive its usefulness to their language learning outcomes or whether they perceive the ease of using it and committing their time to it (Su et al., 2018). Prior studies conducted in the Iranian context demonstrated that Iranian EFL learners value face-to-face classes more than online ones due to a lack of technical

assistance and unstable online learning environments (Jiang et al., 2022). This aligns with Wolters and Brady's (2020) findings, as they claimed that should learners not feel sufficiently motivated, they may not be able to develop a strategic management of their time. This also in contrast with Pereles et al. (2024) who reported that the number of hours spent studying turned out to be significant in deep online learning between Spanish students. Besides previous findings aimed at uncovering the mediation roles of emotional factors (Englund et al., 2022; Han & Geng, 2023) and motivational factors (Englund et al., 2022; Han & Geng, 2023; Rahimi, 2024; Schmidt, 2020; Zakariya et al., 2020), this study adds to the literature the mediation role of cognitive behavior, specifically OSEL, in shaping language learners' OLLA.

6. Conclusion

The current study portrays the systematic relationship between Iranian EFL learners' perceived support and their approaches to online language learning and the mediator role played by OSEL in this relationship. Only a limited amount of data is available to situate these factors in online language learning by means of this study. The findings from the study are, first of all, that instructional, peer, and technical support, along with online self-regulation, may contribute to 49 % and 43 % of language learners' approach to online language learning. As a result, some practical and theoretical implications might be drawn from these findings, which will benefit language teachers, learners, researchers, and administrators in promoting deep learning approaches in online learning environments.

6.1. Theoretical contributions

The present study serves as a stepping stone for the literature on CALL, online language teaching, Psycholinguistics, and English language teaching in five ways: in the first place, the study validated the factorial structure of SAOLT in English language learning and teaching and introduced a new conceptual framework for it, specializing in online language learning, namely, Language learners' approaches to online language learning (OLLA), thus providing a basis for future research works to validate or extend this work in other language contexts. Secondly, the study validated that SAOLT is not specialized for higher educators; rather, it can be applied to uncover secondary students' approaches to their learning context as well. In addition to confirming SAOLT's validity in online language learning, it has also been possible to determine whether language learners wish to either engage in meaningful online language learning or minimize it. This adds language learning to the list of validation contexts of SAOLT, since it has already been validated in other fields, including mathematics (Lahdenperä et al., 2021), Food science (Schmidt, 2020) and STEM education (Han & Geng, 2023; Smarandache et al., 2022; Zakariya et al., 2020). The fourth point is that, as far as researchers are aware, this study is among the first ones to take into account learners' online self-regulation in SAOLT in an effort to shift the focus from uncovering learners' affective sides of their learning, such as emotion (Han & Geng, 2023), motivation (Lu et al., 2021; Rahimi, 2024) and self-efficacy (Ellis & Bliuc, 2019; Han & Geng, 2023) in ICT learning environment, to their cognitive and behavioral sides. Having validated SAL for English language learning and found that it correlates with OSEL, we have now added a new cognitive behavior to the complex dynamic system and psycholinguistics as a whole. As a final point, a significant component of this study is the shift in focus from exploring users' attitudes and continued intentions regarding online learning environments to the SAL. In contrast to recent studies that significantly highlighted the positive role that psychological factors such as self-efficacy and motivation (Han & Geng, 2023) or L2 self-identities (Rahimi, 2024) act as mediators between learners' online perceived supports and their learning approaches, our study provided a new insight to the literature in this regard as the online self-regulation acted as a moderator and mediator variable unlike previous studies.

6.2. Practical implications

A practical approach to the implications can be traced from, at the very least, three angles, namely, from a macro, *meso*, and micro perspective. At the micro level instructors ought to thoughtfully create a course outline and materials that align with learners' desired self-perceptions of online language learning. This is particularly important for learners who are studying a language for immigration or academic reasons. Previous research has indicated that language learners in Iran often learn English with the intention of emigrating abroad (Esmaeili & Kuhi, 2023; Rahimi, 2024). Therefore, instructors should make a concerted effort to incorporate these ideals into their online language syllabus. In this way, language learners will be able to achieve a higher level of online self-regulation to select their goals, manage their time, align with course objectives, evaluate themselves as the course progresses, and ask for help from others, thereby shaping their deep approach to online language learning. Aside from providing engaging materials, they should also approach the online syllabus in an innovative manner and provide learners with more hands-on opportunities for online language learning, a concept referred to as digital self-authenticity in language learning (Rahimi, 2023). Furthermore, more practical topics rather than theoretical ones should be integrated in the online learning environment to increase learners' effort and time devoted to learning, particularly for humanistic subjects such as English. This can also be accomplished in broader fields of language studies since learner's fields of studies and specialization are closely linked to their deep approach to target learning context (Han & Geng, 2023; Meyer,

2000; Zakariya et al., 2020). Additionally, teachers in any fields should also help students become familiar with online platforms and their characteristics so they may use them according to their needs, which might not only bring to high levels of self-regulation but also a deep approach to this context which already indicated by earlier studies as well (Ellis & Bliuc, 2015, 2019; Han & Geng, 2023; Radović et al., 2024; Rahimi, 2024).

Moreover, they should also switch their way of teaching from teacher-centered to peer-centered, as peer support had a higher level of shared variance along with OSEL factors, and a deep approach can be achieved by providing a cooperative and friendly online learning environment where learners share their problems with their peers in a stress-free way. This in turn can help them develop their online self-regulation to set more goals, evaluate their online learning progress, ask for more help when needed, and manage their time efficiently so as to have meaningful online learning experience. Should learners improve their interest and confidence in sharing their problems in peer online language learning, they would ask for more help, set more goals, and evaluate their progress, thus culminating in having meaningful online language learning.

At the meso level, pedagogical experts and executive managers should allocate more budgetary resources to improve online language learning infrastructures with a view toward eliminating the learning problems associated with online learning in Iran, and other countries. It would be beneficial for pedagogical experts to consider integrating several local language classes with each other, thereby broadening their language learning context beyond the local classroom to provide more online peer support among language learners. This is because Rahimi's (2024) studies demonstrated that Iranian EFL learners' perceived peer support predicted their deep engagement with LMOOC, which was based on LMOOC's open context features. In contrast, this had not been the case in OLL. Thus, to have a deeper approach to our online language classes, our executive managers can integrate two or three classes from different cities nationally or extend it to international.

Moreover, they should conduct more teacher training programs to increase educators' digital literacy, which in turn might help them solve learners' technical difficulties during online teaching and suggest ways to identify learners' objectives for learning online so as to design their syllabus accordingly. Previous scholarly literature suggested that language educators should enhance their digital competencies and skills in order to facilitate digital learning for their students (Meihami, 2023). There should also be recommendations to instructors for a greater emphasis on more practical activities in their classrooms, particularly for humanistic subjects such as English language teaching. The instructors should also be trained in how to provide a friendly atmosphere in their online classes, facilitating more peer support, online self-regulation, and a deep approach to learning.

At a macro-level, the study introduces a new conceptual framework to the CALL field and provides new avenues for scholars to evaluate, extend, or revise it in other fields of study and learning environments such as MOOCs, blended learning, virtual exchange, or flipped classrooms.

6.3. Limitations

It is imperative that future studies be conducted to address the limitations identified in this study. Firstly, since all data were collected from participants' self-reported surveys, one reasonable step would be to evaluate learners' learning approaches by observing, interviewing, and analyzing their actual behaviors. A second important aspect of future research is to examine learners' demographic information, including age, gender, and field of study, in relation to their learning approaches. Researchers in the field of language, and psycholinguistic can also validate, extend, or replicate the current conceptual model of OLLA to other contexts of EFL/ESL instruction so as to increase its exploratory power.

CRediT authorship contribution statement

Amir Reza Rahimi: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Resources, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Ana Sevilla-Pavón:** Writing – review & editing, Supervision, Funding acquisition, Project administration.

Authors' contribution

Author 1: Theoretical and methodological framework, study conception and design, data collection, analysis and interpretation of results, draft manuscript preparation, reviewing the results and approving the final version of the manuscript.

Author 2: Proofreading, reviewing the results and approving the final version of the manuscript.

Declaration of generative AI in scientific writing

The authors in the current study did not use any kinds of artificial intelligence in any parts, and sections of the article.

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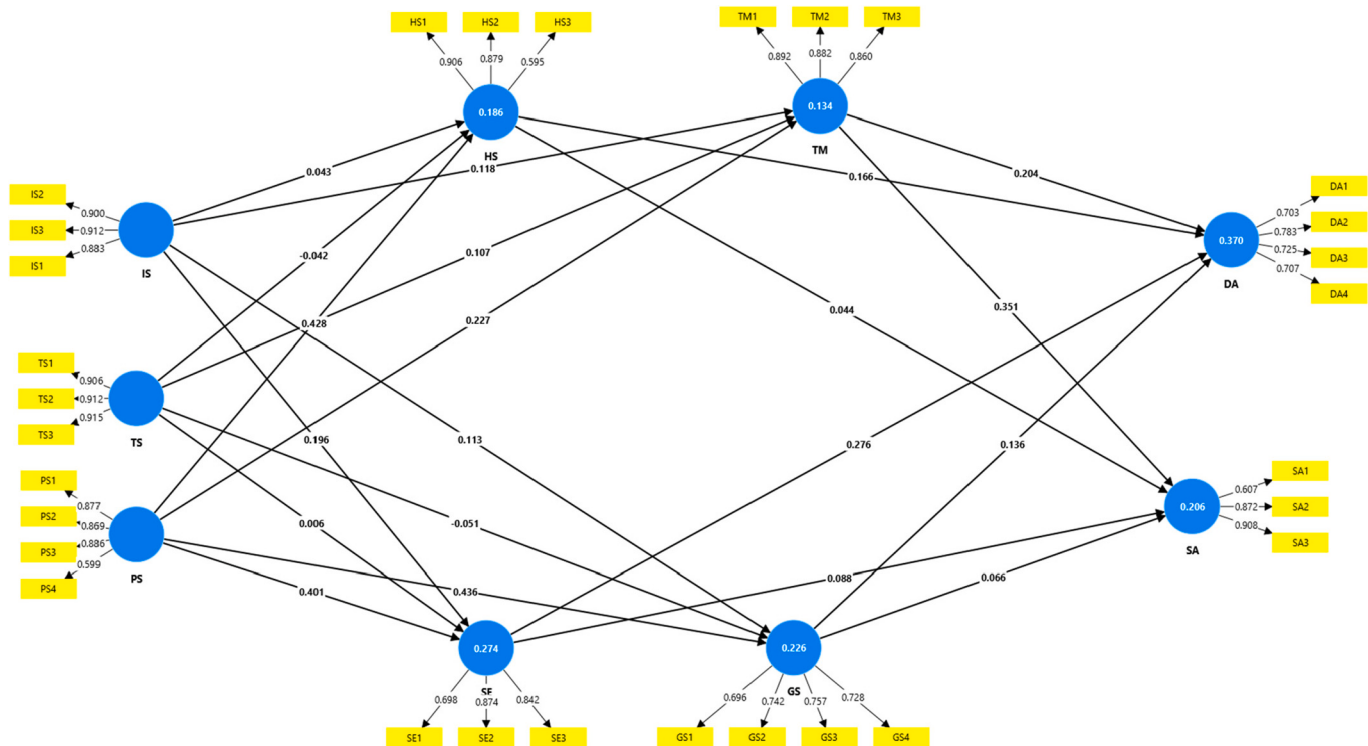
Declaration of competing interest

We confirm that the manuscript has been read and approved by the authors and that there are no other persons who satisfy the criteria for authorship but are not listed.

Appendix 1. The study scale

Variable	Item	Sources
IS1	Our online English course provides relevant language-learning material	Adapted from Lee et al. (2011)
IS2	The instructor responded to students' questions in a timely manner	
IS3	The goals and objectives of the online language course were well-defined.	
TS1	I knew where to ask for help when I had technical issues in our online English language class	
TS2	Technical support responded to my issues in a timely manner	
TS3	I felt that I could get technical support when I needed	
PS1	There were many opportunities to interact with peers in our online English class	
PS2	The group discussions in our online language courses were very enjoyable for me	
PS3	The feedback received on the online language assignments was very helpful.	
PS4	Students in this course were willing to provide help to other students	
HS1	I share my language learning problems with my classmates in our online classrooms so we know what we are dealing with and how to solve our problems	Adapted from Zheng et al. (2018)
HS2	I find someone who is knowledgeable in online English learning so that I can consult with him or her when I need help	
HS3	If needed, I try to meet my classmates face-to-face and discuss problems when learning English online.	
TM1	I try to schedule the same time every day or every week to study English online, and I observe the schedule	
TM2	I allocate extra studying time for learning English online because I know it is time-demanding.	
TM3	I try to schedule the same time every day or every week to learn course materials online, and I observe the schedule.	
SE1	I communicate with my teachers to find out how I am doing with my online English learning	
SE2	I communicate with my classmates to find out how I am doing with my online English learning	
SE3	I communicate with my classmates to find out what I am learning that is different from what they are learning	
GS1	I adhere to a high standard for my online English course	
GS2	I set standards for my assignments when learning the English course online.	Rahimi and Cheraghi (2022)
GS3	I set goals to help me manage study time for my online English learning.	
GS4	I set short-term (daily or weekly) goals as well as long-term goals (monthly or for the semester) when learning the English course online.	
ES1	I choose a good location for learning English online to avoid too much distraction.	
ES2	I find a comfortable place for learning English online	
ES3	I choose a place with few distractions for studying for learning English online.	
TSG1	I try to take more thorough notes for my online English learning because notes are even more important for learning online than in a regular classroom.	
TSG2	I read aloud instructional materials posted online to fight against distractions.	
TSG3	In preparation for learning instructional materials online, I prepare my questions in advance.	
DA1	I try to use online language learning to communicate with other participants to test my language learning development	
DA2	As a result of this course, I spend more time learning language in this online learning environment to enhance my language proficiency.	Adapted from Ellis and Blüch's (2015, 2019)
DA3	For the purpose of attaining native language proficiency, I use online learning technologies in this course.	
DA4	I find using the online learning technologies in this course help me to develop language proficiency	
SA1	I restrict my use of online learning technologies in this course to do as little as possible.	
SA2	I do not find learning English online helps me to learn English more deeply	
SA3	I only use the online learning technologies in this course to fulfill course requirements	

Appendix 2. Structural model with factors loadings



Data availability statement

The datasets used and/or analyzed during the current study are available from the authors on reasonable request.

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