Asian Journal of Distance Education

The Effects of Online Learning Readiness on Self-Regulated Learning for the First-Time Online Learning Students

Yan Dai, Lingfei Luan, Xi Lin

Abstract: This study investigated the influence of students' different Online Learning Readiness (OLR) profiles on their Online Self-Regulated Learning (OSRL) strategies in the context of the first online learning experience (FOL) for students. The data was collected from 262 students in a four-year university in North China during the Spring of 2021. K-mean cluster analysis was conducted to identify groups of participants with distinct patterns of OLR, and one-way MANOVA was used to determine the difference in online OSRL between the different groups. The findings reveal that FOL students with greater levels of OLR also possessed higher levels of OSRL, including goal setting, environmental structuring, task strategies, time management, help-seeking, and self-evaluation. On the basis of the findings, the authors address the function of OLR in establishing OSRL in online learning and its implications for supporting FOL students' self-regulated learning in online learning. The study underlines the need of educating college students in China to succeed in online learning throughout the transition from the COVID-19 global pandemic to the post-pandemic period.

Keywords: online learning readiness, self-regulated learning, online learning, Chinese higher education, COVID-19

Highlights

What is already known about this topic:
- OLR plays a critical role in students' online learning outcomes.
- Effectively using online self-regulated learning strategies is a key element in students' successful online learning.
- Correlations have been found between students' OLR and OSRL, but ORL and OSRL are often investigated separately in the existing literature.

What this paper contributes:
- This study fills the gap regarding how OLR and OSRL are correlated, the extent to which they are connected, and the correlations between specific OLR variables and SRL variables.
- We particularly examine how **first-time** online students with different levels of OLR utilize SRL in online learning to help education professionals better understand the impact of OLR on OSRL for FOL students.
- The study underlines the need to educate college students in China to succeed in online learning throughout the transition from the COVID-19 global pandemic to the post-pandemic period.

Implications for theory, practice and/or policy:
- The present study contributes to the literature by highlighting how OLR profiles FOL students' OSRL, which has pedagogical implications for higher educational institutions, policymakers, and educational professionals.
- These findings are critical, especially in the transition from the COVID-19 global pandemic to the post-pandemic era.

Introduction

The significance of learning motivation and academic preparation to the academic achievement of college students has been universally acknowledged by educational professionals. Due to the extraordinary COVID-19 worldwide epidemic over the past three years, the student body has been forced into a countrywide online learning environment, away from campus, and frequently separated from their peers (Labrague et al., 2021; Priyadarshini & Bhaumik, 2020). The pandemic has forced students and educators across all levels of education to rapidly adapt to online learning (Lockee, 2021). However, FOL students are prone to a lack of readiness due to technical preparation ignorance, inefficient communication, and maladaptive social capacities in the online learning environment. This lack of readiness precludes FOL students from achieving success in their learning. As the transition from the pandemic to the post-pandemic era occurs, some educational institutions may require an immediate return to traditional in-person classes. However, for many institutions, college students are back on campus, but there is still some reliance on online learning platforms. The impact of the pandemic and the changes required to make education work in extreme and emergent situations could permanently change how education is delivered (Lockee, 2021). Therefore, understanding students' online learning readiness and self-regulated learning strategies is critical to improving their learning attainment in online contexts. Although there is a consensus on the importance of self-regulation and learning readiness for college students' success, respectively (Espinosa et al., 2015; Lasfeto & Ulfa, 2023; Rivers et al., 2022; Samruayruen et al., 2013; Tabak & Nguyen, 2013; Torun, 2020; Yavuzalp & Bahcivan, 2021; Zhu et al., 2020), there is a general lack of knowledge regarding the relationship between SRL and OLR for first-time online students. In addition, online learning was not a common format in China before the pandemic, so little is known about the self-regulated learning and online learning preparation of first-time online students, especially in the setting of Chinese colleges. Therefore, it is important to understand the relationship between FOL students' OLR and Online Self-Regulated Learning (OSRL) during the transition from the pandemic to the post-pandemic era.

In accordance with these assumptions, a number of research studies have determined that online learning preparation is crucial for students' performance in online learning, particularly for FOL students (Lasfeto & Ulfa, 2023; Torun, 2020; Yavuzalp & Bahcivan, 2021). To succeed in online learning, students need to be well-prepared and motivated. This includes having the necessary readiness to possess sufficient technical skills to access the internet and utilize LMS, digital communication skills, and social skills to network online and obtain virtual social support (Kauffman, 2015; Yu & Richardson, 2015). Access to technology and technical skills is one of the critical components of OLR, which ensures that students can use LMS and software in an online learning environment (Firat & Bozkurt, 2020; Yang & Xu, 2023). Additionally, communication skills are required so that students may interact successfully with their instructors and peers through different online forums, emails, and digital platforms, as well as participate in online discussions and collaborative group projects (Tanya & Rachel, 2020; AlKhamaiseh, 2022). Moreover, online learning requires sufficient social skills, including social competencies with instructors and classmates, so that students can obtain social, emotional, and intellectual support and resources during the learning process (Borup et al., 2012; Liaw & Huang, 2013; Koˇzuh et al., 2015). Previous research found that OLR enables students to succeed in online learning (Yu & Richardson, 2015). While there is a shortage of literature correlating OLR with student learning achievement, fewer studies have employed a three-dimensional OLR model that takes into account students' technical skills, communication skills, and social skills. Students' OSRL skill is an additional important factor of online learning success, as it enables students to commit and dedicate themselves to online learning, work independently, effectively manage their time and learning environment, and seek necessary assistance and resources, and thus succeed in online learning (Albelbisi, 2019; Albelbisi et al., 2021; Anthonysamy, 2020; Vilkova & Shcheglova, 2021). OSRL has drawn increasing attention in the higher education domain as technology in education continues to develop, allowing individuals to access learning resources without time and space constraints. OSRL includes goal setting, task strategies, time management, environmental structure, help-seeking, and self-evaluation (Barnard et al., 2008; Barnard et al., 2009). Goal setting, task strategies, time management, environmental structure, and help-seeking

are cognitive strategies to manage, monitor, and adjust the learning process, so students are able to set proper goals, create schedules, break complex tasks into manageable chunks, manage time and environment efficiently, and obtain help and resources when need prepared, thus prepare themselves better for online learning (Albelbisi, 2019; Albelbisi et al., 2021; Vilkova & Shcheglova, 2021). Self-evaluation is a metacognitive strategy, which is the process of "thinking of one's thinking." (Albelbisi, 2019; Albelbisi et al., 2021; You & Kang, 2014) to be aware of one's learning strategies, learning behavior, and learning process, and to monitor, regulate, control, and adjust learning process in order to succeed in future learning. OSRL allows students to self-monitor and control their learning process and adapt themselves to online learning contexts. However, OSRL requires students to have some basic preparedness to engage in learning behavior so that they are able to utilize SRL strategies in the online learning environment (Horzum et al., 2015). Especially for FOL students, the use of technology might be overwhelming and challenging (Lin & Dai, 2022) and may require OLR to support and initiate learning prior to using OSRL strategies.

The aforementioned idea is that OLR and OSRL are two important factors that go hand-in-hand in students' learning and influence their online learning success. However, there is still a lack of research investigating the correlation between OLR and OSRL for FOL students. Thus, the purpose of the present study is to investigate the impacts of OSRL on OLR, particularly for FOL students. In doing so, we aim to untangle the effects of OLR on OSRL for first-time online learning students and provide the best pedagogical implications for Chinese higher education institutions and beyond in preparing students for online instruction with readiness and self-regulation to enhance first-time online students' learning experiences.

Literature

Theoretical Framework

The Information Processing Theory (IPT) views learning as a complex process that involves encoding new knowledge into long-term memory and associating it with existing information in working memory. Within this theoretical framework, self-regulated learning parallels metacognitive awareness. This level of consciousness requires individuals to monitor, direct, and control actions toward achieving learning goals. In essence, learners need to understand the demands of the task, their personal competencies, and the optimal strategies to successfully complete the task (Schunk, 2020).

Applied to the context of online learning, the IPT effectively demonstrates the influence of online readiness on self-regulation. Online readiness provides the necessary essence for learners to encode new knowledge, establish a solid basis for self-regulated learning, and effectively operate in an online learning environment. Learners must constantly monitor their progress, adjust their learning strategies to meet task requirements, and self-assess their readiness for various evaluations. Such metacognitive strategies are crucial for success in online learning, reinforcing the argument that online readiness significantly impacts a students' self-regulated learning.

Online readiness enables learners to acquire knowledge, social, and technology base, encompassing task requirements, personal attributes, and strategies to excel in the task. A model that exemplifies this concept within the IPT is the Test-Operate-Test-Exit (TOTE) model proposed by Miller, Galanter, and Pribram (1960). This model presents self-regulated learning as a problem-solving process. The students continuously measure their progress against their goals, operates necessary adjustments if discrepancies arise, and ceases operation when the goal is achieved (Schunk, 2020).

Figure 1. Test-Operate-Test-Exit (TOTE) model (Miller et al., 1960)
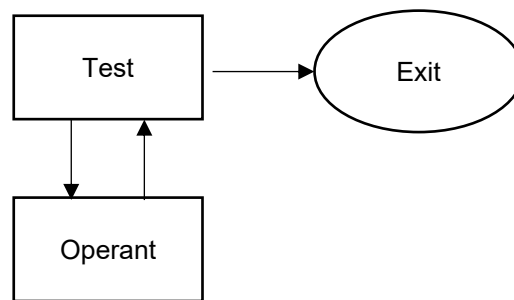
By fostering online readiness, students can effectively apply this model in their learning process, continually adapting their strategies based on their performance. This iterative process inherent to self-regulated learning empowers students to effectively reach their learning objectives in an online environment. This theoretical framework, therefore, elucidates the pivotal role of online readiness in facilitating self-regulated learning within an online context, as per the IPT and TOTE model (Miller et al., 1960; Schunk, 2020)."

Online Learning Readiness (OLR)

OLR refers to the "cognitive awareness and maturity that a student develops for successful learning in a web-based environment. It manifests in the attributes of recognizing the self-directed nature, formulating learning strategies, obtaining technology competencies, adjusting to digital etiquette, and being open to help-seeking" (Liu & Kaye, 2017, p. 242). Scholars have defined OLR as the capacity to profit from online learning's advantages (Lopes, 2007), utilize online learning resources and technologies to increase the quality of learning (Kaur & Abas, 2004), and as a combination of students' preferences for online delivery, their competence and confidence in using online communication, and their ability to engage in online learning (Warner et al., 1998). In short, the concept of OLR depicts an individual's preparedness to perform learning activities in an online environment (Liu, 2019), and the extent to which an individual possesses prior knowledge, cognitive learning strategies, and motivation for effective online learning (Yurdugül & Demir, 2017).

Most conventional approaches offering to evaluate students' readiness for online learning concentrate primarily on technical abilities, ignoring the significance of interaction and communication between students, teachers, and the learning management system (Engin, 2017; Shen et al., 2013). However, communication and social competencies are critical for online learning success due to the potential loneliness, isolation, disconnectedness, and blindness caused by the lack of interpersonal communication in the online learning environment (Bowers & Kumar, 2015; Lyn et al., 2016; Yu, 2018). The Student Online Learning Readiness (SOLR) Model developed by Yu (2018) thoroughly addresses the three components of OLR: social competences (with peers and instructors), communication competencies, and technical competencies. Thus, this study employed Yu's (2018) SOLR to evaluate students' readiness for online learning.

Social competencies can be defined as a person's knowledge and skills necessary for cooperative and creative functioning within a particular social environment (Orpinas & Horne, 2006, p. 108). In other words, social competence refers to a set of skills, knowledge, and traits that enable individuals to interact effectively and appropriately with others in various social environments, such as an online learning platform. It emphasizes on the skills and knowledge necessary for effective social interaction, which is distinct from social efficacy or social confidence. The latter refers to one's belief in their own ability to handle social situations effectively (Smith & Betz, 2002). Notably, an individual can exhibit high social competence yet still lack social confidence due to factors like anxiety or shyness (Carducci, 2009). Academic achievement and overall success in school are inextricably linked to social abilities. Research suggests that students possessing robust social skills often cultivate positive relationships with their

instructors and peers. This, in turn, heightens their enthusiasm, participation, and academic performance. Moreover, social competence prepares students' adaptability to navigate complex social scenarios both in and out of the classroom, alleviating stress and anxiety while boosting overall well-being (Ten et al., 2007). Social competencies are crucial for handling social interactions well in the context of online learning (Orpinas, 2010) and have a substantial impact on students' active participation, collaboration, and academic integration in the online learning environment. Social competencies are further divided into competencies with classmates and with instructors in Yu's (2018) SOLR model. Students with higher social competencies can create better networks within the online learning community and receive more support from peers and instructors, ultimately leading to better online learning attainment. Communication competencies are the ability to communicate effectively within a given situation (Rubin, 1982), knowledge of effective communication patterns, and the ability to use and adapt that knowledge in various contexts (Cooley & Roach, 1984). Communication competencies in the online learning environment enable individuals to cognitively understand the context and construct effective communication approaches (Hargie, 2011), adapt to various online contexts (Jones, 2013), and help curve the isolation and disconnectedness that can be present in online learning contexts. Communication competencies can also facilitate help-seeking and peer support, allowing for reciprocal learning. The level of social and communication competencies can guarantee academic integration (Tinto, 1975; Yu, 2018) and empower students to commit to their study goals, thereby enhancing student persistence and completion rates in online learning courses to increase online learning retention. Technical competencies refer to self-efficacy in technology (Heo, 2011, p. 61). Self-efficacy was first coined by Bandura (1977), who defined it as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3). Pintrich (1991) defined self-efficacy as self-appraisal of one's ability to master a task. In the context of online learning, technical self-efficacy is the perception of one's ability to adapt to technology, experience using technology, and capacity for technical problem-solving (Arunachalam, 2019). Technical self-efficacy is an important factor for students' online learning, as it impacts students' attitudes toward technology and their intention to use an LMS (Park & Yun, 2017). Students learning online with higher technical self-efficacy experience higher learning satisfaction and better performance (KHALID, 2013; Simsek et al., 2021; Tsai et al., 2020; Wang et al., 2013, Yamada et al., 2017). The definition and concept sturcture can be found in Table 1.

Table 1 Student Online Learning Readiness (SOLR) Definition and Concept Structure

Terminology	Structure		Definition	Example
Student Online Learning Readiness (OLR)	Social Competencies	With peers	A person's knowledge and skills necessary for cooperative and creative functioning with peers in a particular social environment (Orpinas & Horne, 2006).	Socially interact with other students
		With instructors	A person's knowledge and skills necessary for cooperative and creative functioning with instructors in a particular social environment (Orpinas & Horne, 2006)	Seek help from instructor when needed
	Communication competencies		The ability to communicate effectively within a given situation (Rubin, 1982), knowledge of effective communication patterns, and the ability to use and adapt that knowledge in various contexts (Cooley & Roach, 1984)	Be comfortable expressing opinion and respond to other people's ideas
	Technical competencies		Self-efficacy in technology (Heo, 2011, p. 61)	Be proficient in using a wide variety of computer technologies

Aside from the critical roles each component of OLR plays in students' online learning outcomes, literature also reveals that OLR, in general, is essential to student online learning willingness, learning quality, and learning attainment (Ngah et a., 2022). For instance, Liu and Kaye (2017) noted that OSRL is fundamental to student learning engagement, class participation, interaction in online courses, and learning achievement. In a study by Tanya and Rachel (2020), which examined the relationship between student OLR and their online learning performance among 620 college students enrolled in an online course in the US, using multiple regression analyses, the results indicated that these participants' OLR significantly influenced their learning outcomes. Their study also revealed that online socialization and online learning skills were significant predictors of learning satisfaction among all OLR factors. Similarly, Cigdem and Ozturk (2016) conducted a study on 155 post-secondary students in Turkey, and after analyzing Pearson correlation and linear regression, they indicated a significant positive relationship between OLR and students' learning achievement. Importantly, self-direction toward online learning was the strongest predictor of learning achievement (Cigdem & Ozturk, 2016). Torun (2020) examined the relationship between OLR and the academic achievement of 153 first-year students who took an online EFL course. A relational model was proposed to measure the predicted readiness levels for academic achievement in online learning. Results indicated that OLR is a robust predictor of academic success among students. Hence, it is crucial to comprehend and investigate efficient strategies for enhancing the OLR of college students.

Online Self-Regulated Learning (OSRL)

Zimmerman (2008) defined SRL as "the self-directive processes and self-beliefs that enable learners to transform their mental abilities into academic performance skills" (p. 166). SRL is a reciprocal interaction of personal, environmental, and behavioral factors. Personal factors include goal setting and self-evaluation, while environmental factors encompass environmental structure. Behavioral factors consist of task strategies, time management, and help-seeking (Barnard et al., 2008; Barnard et al., 2009). In short, SRL is an active and constructive process that involves goal setting, cognitive strategies, and metacognitive self-regulation (Pintrich & Zusho, 2002). Zimmerman and Moylan (2009) proposed SRL as a continuing cyclical process with three components: forethought, performance, and self-reflection. Forethought involves goal setting and strategic planning; performance involves task strategies, time management, and help-seeking; and reflection involves self-evaluation and self-adjustments to produce more informed forethought (Reeve & LEE, 2016). The SRL process is a combination of goal setting, cognitive and metacognitive strategies, time management, help-seeking, and environmental affordances (Reeve & LEE, 2016).

Online SRL refers to the application of SRLused in the online learning environment, which is essential for students' academic achievement, particularly in online learning contexts. This is because emerging technologies have transformed learning environments (Adam et al., 2017). Compared to face-to-face learning, online learning is characterized by greater autonomy (Barnard et al., 2009), but it also means that teaching is delivered to students online, resulting in asynchronous information exchange between educators and students. Consequently, students need to continuously adjust their cognitive and meta-cognitive activities independently to adapt to specific online learning situations and to remain engaged and motivated during the learning process (Garcia & Pintrich, 1991; Maldonado-Mahauad et al., 2018; McMahon & Oliver, 2001). As OSRL draws more attention in higher education, several SRL models have emerged. Barnard et al.'s work (2009) provides a valid model that can be applied to the implementation of SRL theory in the context of online learning. In their proposed model, Barnard et al. (2009) introduce a framework consisting of six dimensions to assess students' OSRL. These dimensions include Goal Setting, Environmental Structure, Task Strategies, Time Management, Help-Seeking, and Self-Evaluation. The OSRL model entails the identification of students' learning targets (Goal Setting), the implementation of cognitive strategies (Task Strategies), the effective management of time (Time Management), the provision of supportive learning environments and resources (Environmental

Structure), the utilization of social support (Help-Seeking), and the evaluation of progress and areas for improvement (Self-Evaluation). It is evident that this model presents a complex and multi-dimensional approach to the assessment of OSRL, which highlights the intricate nature of SRL theory in online learning contexts. The OSRL model coincides with three online learning cyclical and recursive processes involving forethought, performance, and self-reflection. In the forethought online learning process, students set learning goals based on their previous learning experiences, motivational beliefs, and task analysis. In the performance process, students use different learning and time management strategies, along with help-seeking and environmental structure, to achieve their goals. In the self-reflection process, students metacognitively reflect on their goals, self-evaluate their achievements, plans, and strategies (Zimmerman, 2000), and use this information to form new goals and plans for the future (Wong et al., 2019).

Effectively using OSRL strategies is a key element in students' successful online learning. Previous studies have shown that OSRL students usually engage more deeply with coursework and achieve better academic results within an online context (Zimmerman, 2002). For instance, Sun and Rueda (2012) analyzed the self-regulation and behavioral, emotional, and cognitive engagement of 203 online college students in an online learning environment. Their results showed that self-regulation is positively correlated with all types of engagement, indicating that students with higher levels of self-regulation demonstrate higher levels of engagement. Moreover, students' OSRL directly impacts their engagement with learning activities in the online learning context. For example, Littlejohn et al. (2016) used mixed research methods to survey 788 MOOC participants and followed up by interviewing 32 students to compare learning behaviors between students with high and low OSRL profiles. They found that students with high OSRL profiles are more engaged in learning activities and materials that meet their individual needs or interests, while students with low OSRL profiles complete all activities and evaluations simply to obtain a certificate and complete the course. Similarly, Kizilcec et al. (2017) looked at 4831 students' OSRL in asynchronous online courses and found that students with stronger OSRL skills, mainly those who repeatedly use metacognitive strategies such as goal setting and strategic planning, are more engaged with reviewing previous course materials, particularly after the course assessment. Using a mining approach to explore interaction sequences among 3458 students enrolled in online courses, Maldonado-Mahauad et al. (2018) identified three clusters of students based on their interaction sequence patterns. Specifically, students with the highest OSRL profile are categorized as comprehensive students, meaning that these students are more engaged with gaining a deeper understanding of the learning content. Students with a lower OSRL profile compared to comprehensive students are classified as target students who often strategically engage with specific course content to pass the assessment. Lastly, students with the lowest OSRL profiles are sorted as sampling students. These students usually show more erratic and less goal-oriented behaviors. In sum, OSRL is a significant component affecting students' learning and course engagement within the online learning context.

OLR and SRL

Recent studies have shown a strong correlation between OLR and OSRL. For example, Sahdan et al. (2017) investigated the impact of students' readiness on their use of SRL strategies among 86 postgraduate students in Malaysia and found that readiness for learning can lead to the use of SRL strategies. Other studies have also found a positive correlation between OLR and OSRL, suggesting that OLR can scaffold OSRL and promote meaningful learning (Liu & Kaye, 2017). Yavuzalp and Bahcivan (2021) conducted a more recent study on 749 Turkish college students, which revealed that students' OLR positively influenced OSRL and academic achievement. Similarly, Vahedi (2020) examined the effect of OLR on OSRL and students' behavioral tendency to learn in online environments among 223 Iran college students and found that OLR positively impacted OSRL and behavioral tendency to online learning, with motivational beliefs as a mediating factor. Lin and Dai (2022) also conducted a quantitative study exploring the relationship between OLR and OSRL in an online learning

context among 262 Chinese college students and found that students' OLR positively influenced their OSRL. In summary, OLR is an essential factor that impacts students' OSRL and, consequently, their learning achievement within the online context.

In addition, the literature illustrates substantial relationships between each ORL characteristic (technical competence, communication ability, and social competences) and OSRL components. First, as one of the OLR variables, students' technical competence was found to be significantly correlated with their online self-regulation. Specifically, Eom (2012) posits that students' confidence in their ability to use technology, such as Learning Management Systems (LMSs) for online learning, is significantly correlated with their self-regulation. Landrum's (2020) research further confirmed similar results when exploring the relationship between 88 college students' confidence regarding their ability to use online learning platforms, their use of OSRL strategies, and their ability to learn in online classes. In that study, multiple regression analysis indicated significant positive correlations between students' LMS self-efficacy and SRL. Landrum concluded that students with higher confidence levels in their technical ability to use the LMS and their ability to learn online are more likely to adopt and practice skills and strategies in their online courses. The research by Mahmud and German (2021), employing a convergent mixed-method research design, examined 307 university students' EFL SRLlevels, learning adversity, and learning strategies in online learning contexts. The results indicated that students attempted to alleviate technical issues by using self-regulation, including improving time management and adopting more effective learning strategies when they encountered technical issues. A contextual case study by Green and colleagues demonstrated that technology readiness through proper design and implementation of learning environments could benefit students' use of SRLprocesses. Secondly, research alluded to a significant relationship between students' communication competence and online SRL. For instance, Lin and Dai's (2022) study revealed that communication competencies play the most significant role in affecting students' online SRL, followed by technical and social competencies. Furthermore, Chinese college students with higher communication and technical competencies better manage their study time and self-evaluate their online learning. Likewise, students more capable of engaging in meaningful interactions with their instructor and peers are more likely to self-assess their learning. Another OLR variable, social competence, was also found to interact with students' OSRL. Yen et al. (2018) conducted an empirical study on thirty-three online graduate students and found SRL skills important in predicting roles as students' social interaction behaviors in online contexts. Students with greater OSRL skills demonstrated higher competencies in online discussion networks and tended to connect to others more. Similarly, Tsai et al.'s (2013) study on 125 college students using path analysis to unfold the intertwined relationships between students' self-regulation and social constructs within an online learning context found a significant positive relationship between students' online SRL and their social ability, including social navigation, communication skills, and interaction with the instructor and peers. Likewise, Zhu and colleagues (2020) explored students' OSRL capability, online interactions, and online learning intention among 94 college students using paired samples t-tests and interviews. Their study portrayed online social interactions as mediators between OSRL and students' online learning intention.

As mentioned earlier, both OLR and OSRL are critical for college students' online learning attainment. Although correlations have been found between OLR and OSRL, these two variables are often investigated separately among online students. Little is known about how OLR and OSRL are correlated, to what extent they are connected, and the correlations between specific ORL variables and SRL variables.

First-Time Online Students

The online learning environment creates an intimidating experience for students who are new to online courses, mostly owing to their lack of readiness, which then produces heightened levels of anxiety (St Clair, 2015). According to Tyler-Smith (2006), inexperienced online students experience several difficulties and impediments that considerably hinder their confidence and capacity for success in the

online learning environment. Such problems and hurdles, which can emerge in a variety of ways, can have negative consequences on students' learning outcomes and, as a result, result in a poor online learning experience. Hence, it is obvious that the phenomena of online learning preparedness, as well as the accompanying concerns related to anxiety and the capacity to overcome barriers, offer a complex and complicated issue within the framework of online learning. Challenges also include lacking technical skills, being unprepared for text-based communication, handling multiple conversations, information overload, and social isolation (Whipp & Chiarelli, 2004). Online learning requires students to be technically, cognitively, sociologically, and emotionally ready to function effectively in digital environments (Eshet-Alkalai, 2004). In other words, it is necessary for first-time online students to prepare themselves to handle technical, organizational, social, and communicational challenges (Whipp & Chiarelli, 2004) to be competent in utilizing new techniques, interacting with others (Tseng et al., 2020), managing time and environment efficiently, and persisting in the online course independently (Tseng et al., 2019). Students are prone to difficulties when less prepared for online learning, which can negatively affect their learning process, lead to a high level of anxiety at the beginning of the online courses, and result in a high dropout rate (Abdous, 2019; Tyler-Smith, 2006). This is particularly important for Chinese higher education, as most research concerning OLR and OSRL has been conducted in countries where online education has been well-developed and widely used for years, such as Germany (Betermieux & Heuel, 2009), South Korea (Lee & Choi, 2013), and the US (Shen et al., 2013). Little is known concerning the precise effect of ORL on OSRL among the Chinese college student population. Therefore, our study adds to the literature by presenting the specific differences in students' OLR profiles on their OSRL for FOL students, specifically in China, where fully online learning was implemented due to the COVID-19 health emergency. Hence, this study examines how first-time online students with different levels of OLR use OSRL for online learning. This study aims to help higher education professionals better understand the effect of OLR on OSRL for FOL students, thus facilitating their learning in fully online learning environments. Research questions of the present study include:

- RQ1: Is there a difference in students' OSRL based on their varying OLR levels?
- RQ2: Do students with higher OLR exhibit higher OSRL?
- RQ3: To what extent do students' OLR profiles affect OSRL?

This study examines how first-time online students with different levels of OLR utilize SRL for online learning. The aim of this study is to assist higher education professionals in gaining a better understanding of the impact of OLR on OSRL for FOL students, thereby enhancing their ability to learn in fully online learning environments.

Methodology

In this study, our research questions focused on the relationship between two variables: ORL and SRL, specifically whether ORL might influence SRL. We aimed to generalize the results to a broader population, which aligns with the quantitative research schema (Creswell, 2012). Hence, a quantitative research design was employed, involving the process of data collection and analysis through measurement for statistical analysis. We utilized a survey with preset questions and responses as the instrument to measure quantitative data. This survey contained 44 items that have been well validated in psychometric evaluation, and the items have adequate internal consistency to guarantee reliability (Barnard et al., 2008; Barnard et al., 2009; Yu & Richardson, 2015).

The intent of using a quantitative research design with a survey as an instrument lies in the nature of our research questions and the characteristics of the research. Based on Creswell's (2012) educational research design schema, survey research perfectly aligns with our research problem since it allows researchers to describe the behaviors or characteristics of the population through a survey of a sample. In this study, convenient sampling was conducted from a large number of participants. We analyzed data relating to variables using statistical analysis and interpreted results by comparing them with prior predictions, aiming to generalize the results to a broader population. The research process followed the

typical quantitative research process flow chart by Creswell (2012, p.12). Details of the methods used are provided below.

Participants and Procedure

A convenience sampling procedure was used to recruit participants. An invitation email with the link to an anonymous survey was sent to a total of 262 students in a four-year university in North China in the Spring of 2021. Students were recruited across different majors to ensure the sample diversity, including computer science, biology, engineering, linguistics, communication, public administration, economics, finance, law study, etc. A total of 206 (response rate equal to 78.6%) students completed the survey with age mean equals to 20 years old (age ranges from 18 to 29). Among these students, 64 (31.1%) were male, 138 (68.3%) were female, and four (1.9%) did not disclose their gender. In the present study, all surveyed participants were students learning online for the first-time. Participants voluntarily completed a 10-minute anonymous survey on Qualtrics after thoroughly reading and understanding the informed consent. The study was performed in accordance with the ethical standards laid down by American Psychology Association (APA). All research procedures were approved by the Institutional Review Boards (IRB) for the Protection of Human Subjects in the Research Office of the first author's University, USA. In the United States, the IRB is a committee responsible for approving research involving human subjects to ensure that ethical standards are met, and participants' rights and welfare are protected.

Instruments

Student Online Learning Readiness (SOLR)

The instrument used to examine students' OLR was adopted from the SOLR Instrument developed by Yu and Richardson (2015). The SOLR consists of 20 items, including five items to evaluate social competencies with the instructor (SWT), five items to measure social competencies with classmates (SWC), four items to assess communication competencies (CC), and six items to survey technical competencies (TC). The ten items of SWT and SWC were adopted from Shen et al.'s (2013) online learning self-efficacy scale, and both SWT and SWC aim to measure students' social competencies in online learning environments. These questions ask online students about their level of confidence regarding different social interaction tasks with their instructors and classmates in online courses, such as "Clearly ask my instructor questions," "Timely inform the instructor when unexpected situations arise," "Initiate social interaction with classmates," and "Develop friendships with my classmates." CC measures students' communication competencies in online learning, including their psychological characteristics (e.g., motivation, attitude, and confidence), learning style (e.g., group work, independence, and communication), and situational factors (e.g., commuting issues, schedule conflicts, and access) (Dray & Miszkiewicz, 2007). Four items were included to measure this dimension, such as "I am comfortable expressing my opinion in writing to others," "I give constructive and proactive feedback to others even when I disagree." TC was adopted and modified from Wozney et al.'s (2006) instrument to measure online students' technical competencies. Six items were selected to investigate students' perceptions of the process of incorporating computer technology in online learning activities, their experience with computer technologies, and their professional views of computer technology. Sample questions include "I have a sense of self-confidence in using computer technologies for specific tasks" and "I am competent at integrating computer technologies into my learning activities." A seven-point Likert scale (1 = Strongly Disagree to 7 = Strongly Agree with 4 = Neutral) was utilized. The Cronbach's alpha for TC, CC, SWT, and SWC is 0.91, 0.89, 0.90, and 0.92, respectively, indicating the validity of the present study.

Online Self-Regulated Learning Questionnaire (OSLQ)

The Online Self-Regulated Learning Questionnaire (OSLQ) (Barnard et al., 2008; Barnard et al., 2009) was utilized to investigate students' online SRL with 24 items. Six dimensions were identified, including Goal Setting (GS) with five items (e.g., "I set standards for my assignments in online courses," "I set goals to help me manage study time for my online courses"), Environment Structure (ES) with four items (e.g., "I choose a location where I can study most efficiently for online courses," "I try to avoid too much distraction when studying for online courses"), Task Strategies (TS) with four items (e.g., "I read instructional materials aloud to fight distractions," "I work extra problems to master the course content"), Time Management (TM) with three items (e.g., "I allocate extra studying time for my online courses because I know they are time-demanding," "I try to distribute my studying time evenly across days, even though we don't have to attend daily classes"), Help-Seeking (HS) with four items (e.g., "I am persistent in getting help from the instructor through email," "I consult with someone knowledgeable in course content when I need help"), and Self-Evaluation (SEV) with four items (e.g., "I summarize my learning in online courses to examine my understanding of what I have learned," "I ask myself a lot of questions about the course material when studying for an online course"). A seven-point Likert scale (1 = Strongly Disagree to 7 = Strongly Agree with 4 = Neutral) was used. In this study, the Cronbach's alpha for GS, ES, TS, TM, HS, and SEV is 0.92, 0.88, 0.86, 0.86, 0.87, and 0.91, respectively, indicating the validity of this survey.

Data Analysis

K-mean cluster analysis was conducted to identify the groups of participants with their distinct patterns of OLR using SPSS 27. One-way MANOVA was used to determine the difference in online OSRL between the different groups. The alpha level was set at 0.05.

Results

Table 2 shows that the two groups were a good model (Iteration = 7). Then the cluster analysis grouped participants into two categories: high OLR (N=115) and low OLR (N=81).

Table 2. Iteration history of change in cluster

| Iteration	Centers	
N	1	2
1	2.741	3.841
2	0.215	0.288
3	0.94	0.146
4	0.1	0.147
5	0.028	0.039
6	0.026	0.036
7	0	0

Table 3 and Figure 2 show that students with high OLR have a higher level of TC, CC, SWT, and SWC than those with low OLR. Additionally, results furthermore indicate all four OLR factors were significant differences between the two groups (F_{OLR_TC} =212.54, $p<.001$, F_{OLR_SWT}=184.05, $p<.001$, F_{OLR_SWC}=221.76, $p<.001$, F_{OLR_TC}=227.17, $p<.001$).

Table 3. Cluster results

Cluster Results	Cluster	
	1	2
OLR_TC	0.6	-0.86
OLR_SWT	0.58	-0.83

OLR_SWC	0.61	-0.87
OLR_CC	0.61	-0.87

Figure 2. Cluster analysis of OLR groups.
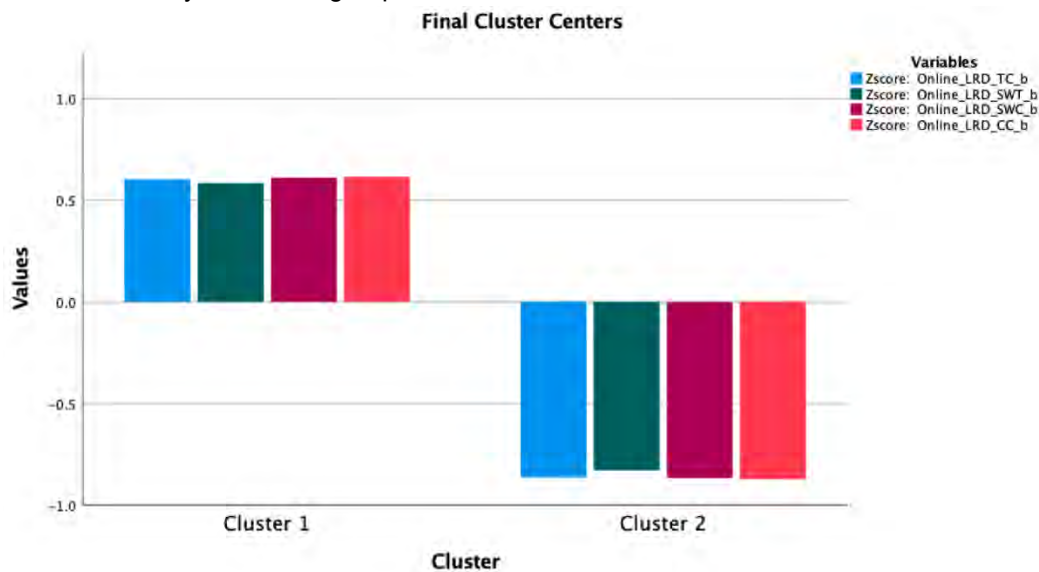
Next, one-way MANOVA was conducted to compare online SRL between the high and low OLR groups. Pillai's trace was used (Box's M=56.73, p < .001), and data indicated that online SRL was significantly different between the two groups (F =26.64, p < .001) with all online SRL were found different with large effect size (see Table 4).

Levene's test indicated that none of the dependent variables violated the assumption of homogeneity of variance. Therefore, we performed univariate ANOVA on each dependent variable to determine the locus of the statistically significant multivariate effect. The results of the between-subject test demonstrated that students' OLR level had a significant effect on their goal setting, environment structure, task strategies, time management, help-seeking, and self-evaluation (see Table 4). Table 4 also demonstrates that students with high OLR were better able to use self-regulated strategies to manage their online learning, including setting goals (Mdifferent = 1.38), finding a place to study (Mdifferent = 1.01), using and adapting methods to complete learning tasks (Mdifferent = 1.26), manage study time (Mdifferent = 1.23), seeking help from both instructors and peers (Mdifferent =1.09), and self-evaluate their learning (Mdifferent = 1.37).

Table 4. Means, Standard Deviations, and One-Way Analysis of Variance in OLR between OLR Groups

Measure	High OLR group		Low OLR group		F (1, 191)	η^2
	Mean	*SD*	*Mean*	*SD*		
SRL_GS	5.41	0.87	4.03	0.89	115.39***	0.38
SRL_ES	5.75	0.78	4.74	0.95	64.22***	0.25
SRL_TS	5.46	0.8	4.21	0.77	116.14***	0.38
SRL_TM	5.53	0.82	4.3	0.79	107.36***	0.36
SRL_HS	5.36	0.95	4.27	0.79	68.86***	0.27
SRL_SEV	5.61	0.8	4.25	0.87	125.66***	0.40

***p< .001

Discussions

While some preliminary research in the area of online learning has yielded a significant positive relationship between OLR and OSRL (Lin & Dai, 2022; Yayuzalp & Bahciyan, 2021), the present study's results echo previous research and further disentangle the differences between students' OSRL based on varying levels of OLR. The results revealed that students with high OLR also had higher OSRL than their low OLR group counterparts. In other words, the better FOL students are prepared in terms of

cognitive awareness and maturity for an online learning context, the better they will recognize the self-directed nature of online learning and formulate their own learning strategies, obtain technology competencies, adjust to digital etiquettes, and be open to help-seeking (Liu & Kaye, 2017). Subsequently, these students can self-direct themselves to transfer their learning competencies into cognitive and metacognitive academic strategies (Pintrich & Zusho, 2002) to utilize online learning resources and technologies to increase the quality of learning (Kaur & Abas, 2004; Lopes, 2007). This finding has important pedagogical implications for understanding and assisting FOL students' online learning. Since there is a noticeable difference in students' OSRL between those with various levels of preparedness, it is critical to scaffold FOL students in their OLR prior to enrolling in online courses. Since OSRL is a multifaceted concept that encompasses a wide range of factors, including goal setting, task strategies, time management, help-seeking, and self-evaluation, and each factor was well profiled by students' OLR, we will address these factors in detail with implications for scaffolding FOL students' improvement in their OSRL.

Firstly, by further exploring the relationship between the different facets of OLR and OSRL, our study discovered that FOL students with a greater level of learning readiness employ more effective goal-setting techniques. In other words, students who are better prepared for online learning can set learning targets to direct their learning, resulting in a better understanding of the technology, LMS, and nature of online learning, enabling them to navigate themselves to set goals to complete the course, and hence, reducing the likelihood of dropping out (Handoko et al., 2019). Similarly, students with a higher level of online preparedness in their time management and environment structure were found to have better resource management strategies (Pintrich, 1991), enabling them to regulate their time through scheduling and planning and manage their study environment by setting up organized, quiet, and visually and audibly distraction-free zones (Pintrich, 1991). These are essential for online learning due to the high demand for independence, autonomy, and the impact of digital distraction on online learning by nature (Albelbisi, 2019; Albelbisi et al., 2021; Anthonysamy, 2020; Barnard et al., 2009; Vilkova & Shcheglova, 2021). Notably, students with better OLR have better technical capacities, prioritize their time and environment management, and consequently reduce digital distractions, leading to better learning achievement (You & Kang, 2014; Liaw & Huang, 2013).

In terms of resource management, help-seeking behavior, which is an important component identified by Pintrich (1991), were found to vary between students depending on their OLR. Students with high OLR levels exhibit more engagement in help-seeking behaviors compared to those with lower OLR levels. This does not necessarily suggest that one group is superior to the other, but rather indicates that they approach help-seeking in distinct ways due to their varying readiness for online learning. As help-seeking includes both peers and instructors, students must have social and communication capacities to identify and communicate with someone to provide them with assistance to facilitate their online learning achievement (Pintrich, 1991). Additionally, task strategies are critical components of the process of self-regulated learning. The present results indicated that students with better OLR (i.e., those who are more mature in technical skills, tend to have more online social capacities, and are more reliable in communicating with peers and instructors) are more capable of utilizing online learning task strategies, such as taking more detailed notes for online courses because notes are even more critical for learning online than in a regular classroom (Barnard et al., 2008, p.5).

Besides, the results also showed that students with better OLR have higher levels of self-evaluation strategies. According to Zimmerman & Schunk (2001), self-evaluation is an integral component of self-regulated learning and involves the act of analyzing one's performance or progress in accordance with a set of criteria or goals. Students with high technical, communication, and social capacities, meaning they are more prepared in the online learning environment, tend to be more involved in tracking their learning progress, seeking feedback from peers and instructors, and reflecting on their learning. In doing so, it is easier for them to form new goals and plans for the future (Wong et al., 2019). The present study contributes to the literature by highlighting how OLR profiles FOL students' OSRL, which has

pedagogical implications for higher educational institutions, policymakers, and educational professionals.

As students with higher OLR tend to have higher Online OSRL, it is essential to focus on enhancing the OLR of FOL students. Firstly, the present study supports previous research that students' technical competence, a critical variable of OLR, significantly correlates with their OSRL (Eom, 2012; Mahmud & German, 2021; Landrum, 2020). Therefore, to prepare FOL students to be technically and motivationally ready for online learning, online course orientations, guidelines, and workshops would be helpful. Furthermore, higher education institutions should provide teaching assistants, IT support, and sufficient instructor office hours to ensure FOL students have substantial resources for technical troubleshooting when facing challenges. Secondly, the results support previous studies that found communication competence to be significantly related to OSRL (Lin & Dai, 2022). Moreover, the present study reveals that students with higher OLR tend to have higher OSRL, particularly in China, where fully online learning was implemented due to the COVID-19 health emergency. This finding implies that assisting FOL students in enhancing their communication skills, including communication with peers and instructors, would be beneficial to their OSRL. For instance, instructors can design online class activities based on collaborative learning (Yates et al., 2021). Additionally, an online learning community can be developed to encourage FOL students' communication and help-seeking (Islam, 2016; Lin & Dai, 2021). Lastly, the study confirms previous research that social competence is essential for OSRL (Tsai et al., 2013; Yen et al., 2018; Zhu et al., 2020). The study further reveals that FOL students with higher social capacities also have higher levels of OSRL skills. Online learning may create a sense of isolation, loneliness, and disconnection caused by the lack of interpersonal communication in the virtual learning environment (Bowers & Kumar, 2015; Lyn et al., 2016; Yu, 2018), hindering OSRL and learning engagement. For students with lower social competencies, it's crucial that educators and instructors comprehend their specific needs to better facilitate their learning. To optimize the learning outcomes, pedagogical strategies and course designs should be tailored to meet the requirements of students at various social competence levels to foster improvement rather than discord. Specifically, instructors should create a learning environment that includes social media learning groups, notification tools in the Learning Management System (LMS), and instant messaging apps (Tseng et al., 2019). Such tools would provide FOL students with opportunities to learn and work within meaningful socio-technical networks and reflect on how learning is connected with other areas of personal, social, and working lives. In this way, students can navigate their learning and improve their OSRL.

Finally, we acknowledge that this study has some limitations. First, the results may not be generalizable to all Chinese college students since the study solely focuses on FOL students during the COVID-19 outbreak. Therefore, future studies should include participants from diverse universities and student populations. Secondly, the use of Multivariate analysis of variance (MANOVA) is limited as it may not capture potentially important variables that could be mediating factors between OLR and OSRL, such as learning anxiety, sense of community, and learning self-efficacy. Further research could explore these variables and their relationships with OLR and OSRL. Additionally, this study did not distinguish between different online course modalities, which could yield different results. Future research should investigate the relationship between OLR and OSRL across various online course formats. It is also essential to note that students' previous experiences with online courses could impact their OLR and their use of SRL strategies. Hence, future research should consider students' prior online course experiences to explore these relationships further.

Despite these limitations, this study highlights Chinese FOL students' readiness for online courses and its impact on their online learning self-regulation. However, the study was conducted during a pandemic when universities were forced to switch to online learning suddenly. Thus, students may not have had sufficient time to prepare for online learning, leading to a lack of readiness and willingness to participate in online learning, which could affect their self-regulated learning. Additionally, some technical issues may have impacted students' OLR due to the transition to a new learning management system.

Consequently, future post-pandemic and longitudinal studies are necessary to explore these issues further.

Conclusions

This exploratory study investigates the effects of OLR on OSRL for first-time online learning college students within the context of a Chinese university. The findings reveal that first-time online learning students with higher levels of OLR also have significantly higher levels of OSRL skills across SRL facets, including goal setting, environment structure, task strategies, time management, help-seeking, and self-evaluation. Considering the importance of OLR in modeling students' online SRL skills, it is important to shape students' OLR to amplify the benefits of their SRL during the online learning process. Since OLR can be improved by enhancing students' technical, communication, and social capacities, the findings offer robust and specific suggestions on how to prepare students for online study, motivating them to self-regulate their learning and enhance their performance and outcomes. These findings are critical, especially in the transition from the COVID-19 global pandemic to the post-pandemic era.

Some educational institutions may require an immediate return to in-person classes, but many institutions still rely on online learning platforms. The impact of the COVID-19 global pandemic and the developments required to make education work in extreme situations have permanently changed how education is delivered (Lockee, 2021). In echo with this trend, our study emphasizes the significance of preparing college students, specifically in countries like China where face-to-face instruction was predominantly used, to be successful in online learning environments. It is expected that this study will enlighten higher education professionals, university stakeholders, and students to understand the importance of gaining the necessary knowledge and skills for online learning to adapt to the new norm.

References

Abdous, M. (2019). Influence of satisfaction and preparedness on online students' feelings of anxiety. *Internet & Higher Education, 41*, 34–44. https://doi.org/10.1016/j.ihedu c.2019.01.001

Adam, N. L., Alzahri, F. B., Cik Soh, S., Abu Bakar, N., & Mohamad Kamal, N. A. (2017, November). Self-regulated learning and online learning: a systematic review. In *International Visual Informatics Conference* (pp. 143-154). Springer, Cham. https://doi.org/10.1007/978-3-319-70010-6_14

Albelbisi, N. A. (2019). The role of quality factors in supporting self-regulated learning (SRL) skills in MOOC environment. *Education and Information Technologies*, *24*(2), 1681-1698. https://doi.org/10.1007/s10639-018-09855-2

Albelbisi, N. A., Al-Adwan, A. S., & Habibi, A. (2021). Self-regulated learning and satisfaction: A key determinants of MOOC success. *Education and Information Technologies*, *26*(3), 3459-3481. https://doi.org/10.1007/s10639-020-10404-z

AlKhamaiseh, O. S. (2022). Communication Skills and Its Role in Decreasing Tension in Online Learning during COVID-19 Pandemic: Case Study of Public Schools. *Cypriot Journal of Educational Sciences, 17*(2), 357–371. https://doi.org/10.18844/cjes.v17i2.6812

Anthonysamy, L., Koo, A. C., & Hew, S. H. (2020). Self-regulated learning strategies in higher education: Fostering digital literacy for sustainable lifelong learning. *Education and Information Technologies*, *25*, 2393-2414. https://doi.org/10.1007/s10639-020-10201-8

Bandura, A. (1977). Self-efficacy. In V. S. Ramachaudran (Ed.), *Encyclopedia of human behavior* (Vol. 4, pp. 71-81). New York: Academic Press. (Reprinted in H. Friedman [Ed.], Encyclopedia of mental health. San Diego: Academic Press, 1998). http://happyheartfamilies.citymax.com/f/Self_Efficacy.pdf

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191.

https://www.academia.edu/download/55330532/Bandura1977_SelfEfficacy_for_Behavioral_Change.pdf

Bandura, A., & McClelland, D. C. (1977). *Social learning theory* (Vol. 1). Prentice Hall. https://doi.org/10.1177/105960117700200317

Barnard, L., Lan, W. Y., Crooks, S. M., & Paton, V. O. (2008). The relationship of epistemological beliefs with self-regulatory skills in the online course environment. *Journal of Online and Learning Teaching, 4*(3), 26–-266.

Barnard, L., Lan, W. Y., To, Y. M., Paton, V. O., & Lai, S. L. (2009). Measuring self-regulation in online and blended learning environments. *The Internet and Higher Education, 12*, 1-–6. https://doi.org/10.1016/j.iheduc.2008.10.005

Betermieux, S., & Heuel, E. (2009, October). Design and use of a web based support tool for students' self-management in university and distance university settings. In *E-Learn: World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education* (pp. 3454-3459). Association for the Advancement of Computing in Education (AACE).

Borup, J., West, R. E., & Graham, C. R. (2012). Improving online social presence through asynchronous video. *Internet and Higher Education, 15*(3), 195-203. https://doi.org/10.1016/j.iheduc.2011.11.001

Bowers, J., & Kumar, P. (2015). Students' perceptions of teaching and social presence: A comparative analysis of face-to-face and online learning environments. International *Journal of Web-Based Learning and Teaching Technologies (IJWLTT), 10*(1), 27–44. https://doi.org/10.4018/ijwltt.2015010103

Carducci, B. J. (2009). *The psychology of personality: Viewpoints, research, and applications*. Wiley-Blackwell.

Cigdem, H., & Ozturk, M. (2016). Critical components of online learning readiness and their relationships with learner achievement. *Turkish Online Journal of Distance Education*, *17*(2). https://doi.org/10.17718/tojde.09105

Cooley, R. E., and Deborah A. Roach. (1984). "A conceptual framework," in *Competence in communication: A multidisciplinary approach*, ed. Robert N. Bostrom (Beverly Hills, CA: Sage, 1984), 25. https://open.lib.umn.edu/communication/chapter/1-4-communication-competence/

Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. Pearson.

Dray, B.J., & Miszkiewicz, M. (2007). The intersection of learner characteristics and technology capabilities: implications for online learning. Paper presented at the *2007 AERA Annual Meeting*, Chicago, IL. https://www.researchgate.net/publication/49250852_The_Intersection_of_Learner_Characteristics_and_Technology_Capabilities_Implications_for_Online_Learning

Engin, M. (2017). Analysis of students' online learning readiness based on their emotional intelligence level. *Universal Journal of Educational Research*, *5*(n12A), 32-40. https://doi.org/10.13189/ujer.2017.051306

Eom, S. B. (2012). Effects of LMS, self-efficacy, and self-regulated learning on LMS effectiveness in business education. *Journal of International Education in Business, 5*(2), 129–144. https://doi.org/10.1108/18363261211281744

Eshet, Y. (2004). Digital literacy: A conceptual framework for survival skills in the digital era. *Journal of educational multimedia and hypermedia, 13*(1), 93-106. https://www.learntechlib.org/p/4793/

Espinosa, Brenda Jeanett García, Gloria Concepción Tenorio Sepúlveda, and María Soledad Ramírez Montoya. "Self-motivation challenges for student involvement in the open educational movement with MOOC." *International Journal of Educational Technology in Higher Education* 12.1 (2015): 91. https://doi.org/10.7238/rusc.v12i1.2185

Firat, M., & Bozkurt, A. (2020). Variables affecting online learning readiness in an open and distance learning university. *Educational Media International, 57*(2), 112–127. https://doi-org.spot.lib.auburn.edu/10.1080/09523987.2020.1786772

García, T., & Pintrich, P. R. (1991, April). Student motivation and self-regulated learning: A LISREL model in Annual Meeting of the *American Educational Research Association*, Chicago, IL. https://files.eric.ed.gov/fulltext/ED333006.pdf

Handoko, E., Gronseth, S. L., McNeil, S. G., Bonk, C. J., & Robin, B. R. (2019). Goal setting and MOOC completion: A study on the role of self-regulated learning in student performance in massive open online courses. *International Review of Research in Open and Distributed Learning*, *20*(3). https://doi.org/10.19173/irrodl.v20i4.4270

Hargie, O., *Skilled Interpersonal interaction: Research, theory, and practice* (London: Routledge, 2011), 9. https://doi.org/10.4324/9781003182269

Heo, W., Park, N., & Park, K. (2020). Classifying students using an expectation-perception survey about a hospitality laboratory class: Empirical research with the finite mixture model. *Anatolia*, *31*(1), 50–61. https://doi.org/10.1080/13032917.2019.1697890

Horzum, M. B., Kaymak, Z. D., & Gungoren, O. C. (2015). Structural equation modeling towards online learning readiness, academic motivations, and perceived learning. *Educational Sciences: Theory & Practice*, *15*(3). https://doi.org/10.12738/estp.2015.3.2410

Jones, R. (2013). *Communication in the real world: An introduction to communication studies*. The Saylor Foundation.

Kauffman, H. (2015). A review of predictive factors of student success in and satisfaction with online learning. *Research in Learning Technology, 23.* http://dx.doi.org/10.3402/rlt.v23.26507

Kaur, S., & Abas, H. (2004). E-learning: a study on acceptance among Malaysian undergraduates. *Asia Pacific Journal of Educators and Education, 19*, 1-17.

KHALID, A. I. (2013). Infrastructure and e-learning readiness in Bangladesh. *Asian Journal of Distance Education*, *11*(1), 52 - 58.
http://asianjde.com/ojs/index.php/AsianJDE/article/view/220

Kizilcec, R. F., Pérez-Sanagustín, M., & Maldonado, J. J. (2017). Self-regulated learning strategies predict learner behavior and goal attainment in massive open online courses. *Computers & Education, 104*, 18–33. https://doi.org/10.1016/j.compedu.2016.10.001

Koˇzuh, I., Jeremiˊc, Z., Sarjaˇs, A., Bele, J. L., Devedˇziˊc, V., &Debevc, M. (2015). Social presence and interaction in learning environments: The effect on student success. *International Forum of Educational Technology & Society, 18*(1), 223–236.

Labrague, L. J., & de Los Santos, J. A. A. (2021). Fear of Covid-19, psychological distress, work satisfaction and turnover intention among frontline nurses. *Journal of nursing management*, *29*(3), 395-403. https://doi.org/10.1111/jonm.13168

Landrum, B. (2020). Examining students' confidence to learn online, self-regulation skills and perceptions of satisfaction and usefulness of online classes. *Online Learning, 24*(3), 128–146. https://doi.org/10.24059/olj.v24i3.2066

Lasfeto, D. B., & Ulfa, S. (2023). Modeling of online learning strategies based on fuzzy expert systems and self-directed learning readiness: The effect on learning outcomes. *Journal of Educational Computing Research*, *60*(8), 2081-2104. https://doi.org/10.1177/07356331221094249

Lee, Y., & Choi, J. (2013). A structural equation model of predictors of online learning retention. *The Internet and Higher Education, 16*, 36–42. https://doi.org/10.1016/j.iheduc.2012.01.005

Liaw, S. S., & Huang, H. M. (2013). Perceived satisfaction, perceived usefulness and interactive learning environments as predictors to self-regulation in e-learning environments. *Computers & Education*, *60*(1), 14-24. https://doi.org/10.1016/j.compedu.2012.07.015

Lin, X., & Dai, Y. (2022). An exploratory study of the effect of online learning readiness on self-regulated learning. *International Journal of Chinese Education*, *11*(2), 2212585X221111938. https://doi.org/10.1177/2212585x221111938

Littlejohn, A., Hood, N., Milligan, C., & Mustain, P. (2016). Learning in MOOCs: Motivations and self-regulated learning in MOOCs. *The Internet and Higher Education, 29*, 40–48. https://doi.org/10.1016/j.iheduc.2015.12.003

Liu, J. C. & Kaye, E. R. (2016). Preparing Online Learning Readiness with Learner-Content Interaction: Design for Scaffolding Self-Regulated Learning. In L. Kyei-Blankson, J. Blankson, E. Ntuli, & C. Agyeman (Eds.), *Handbook of Research on Strategic Management of Interaction, Presence,*

and Participation in Online Courses (pp. 216-243). IGI Global. https://doi.org/10.4018/978-1-4666-9582-5.ch009

Liu, J. C. (2019). Evaluating online learning orientation design with a readiness scale. *Online Learning*, *23*(4), 42–61. https://doi.org/10.24059/olj.v23i4.2078

Lockee, B. B. (2021). Online education in the post-COVID era. *Nature Electronics*, *4*(1), 5-6. https://doi.org/10.1038/s41928-020-00534-0

Lopes, C. T. (2007). Evaluating e-learning readiness in a health sciences higher education institution. In *IADIS International Conference ELearning*. https://www.iadisportal.org/digital-library/evaluating-e-learning-readiness-in-a-health-sciences-higher-education-institution

Lyn, J., Choy, F., & Quek, C. L. (2016). Modelling relationships between students ' academic achievement and community of inquiry in an online learning environment for a blended course. *Australasian Journal of Educational Technology, 32*(4), 106–124. https://doi.org/10.14742/ajet.2500

Mahmud, Y. S., & German, E. (2021). Online self-regulated learning strategies amid a global pandemic: Insights from Indonesian university students. *Malaysian Journal of Learning and Instruction*, *18*(2), 45-68. https://doi.org/10.32890/mjli2021.18.2.2

Maldonado-Mahauad, J., Pérez-Sanagustín, M., Kizilcec, R. F., Morales, N., & Munoz-Gama, J. (2018). Mining theory-based patterns from Big data: Identifying self-regulated learning strategies in Massive Open Online Courses. *Computers in Human Behavior, 80*, 179–196. https://doi.org/10.1016/j.chb.2017.11.011

McMahon, M., & Oliver, R. (2001). Promoting self-regulated learning in an online environment. *Ed-Media 2001 World Conference on Educational Multimedia, Hypermedia & Telecommunications* (pp. 1299–1305). Charlottesville, VA: Association for the Advancement of Computing in Education (AACE). https://eric.ed.gov/?id=ED466125

Miller, G. A., Galanter, E., & Pribham, K. H. (1960). Plans and the structure of behavior. New York: Holt, Rinehart & Winston. https://doi.org/10.1002/bs.3830050409

Ngah, A. H., Kamalrulzaman, N. I., Mohamad, M. F. H., Rashid, R. A., Harun, N. O., Ariffin, N. A., & Osman, N. A. A. (2022). The sequential mediation model of students' willingness to continue online learning during the COVID-19 pandemic. *Research and Practice in Technology Enhanced Learning*, *17*(1), 1-17. https://doi.org/10.1186/s41039-022-00188-w

Orpinas, P. (2010). Social competence. *The corsini encyclopedia of psychology*, p.1-2. https://doi.org/10.1002/9780470479216.corpsy0887

Orpinas, P., & Horne, A. M. (2006). Bullying prevention: Creating a positive school climate and developing social competence. *American Psychological Association*. https://doi.org/10.1037/11330-000

Park, J., & Yun, D. (2017). The effects of social media on Korean undergraduate students' social capital. *Journal of Educational Technology & Society, 20*(1), 203-214.

Pintrich, P. R., & De Groot, E. V. (1990). *Motivated strategies for learning questionnaire (MSLQ)*. APA PsycTests. https://doi.org/10.1037/t09161-000

Pintrich, P. R., & Zusho, A. (2002). Student motivation and self-regulated learning in the college classroom. In L. W. Perna (Ed.) *Higher education: Handbook of theory and research* (pp. 55–128). Springer, Dordrecht. https://doi.org/10.1007/978-94-010-0245-5_2

Priyadarshini, A., & Bhaumik, R. (2020). E-readiness of senior school learners to online learning transition amid COVID-19 lockdown. *Asian Journal of Distance Education*, *15*(1), 244-256. http://asianjde.com/ojs/index.php/AsianJDE/article/view/456

Reeve, J., & LEE, W. O. (2016). Neuroscientific contributions to motivation in education. In *Handbook of motivation at school* (pp. 436-451). Routledge. https://doi.org/10.4324/9781315773384-29

Rivers, D. J., Nakamura, M., & Vallance, M. (2022). Online self-regulated learning and achievement in the era of change. *Journal of Educational Computing Research*, *60*(1), 104-131. https://doi.org/10.1177/07356331211025108

Rubin, R. B. (1982). Assessing speaking and listening competence at the college level: The communication competency assessment instrument. *Communication Education, 31*(1), 19-32. https://doi.org/10.1080/03634528209384656

Sahdan, S., Masek, A., & Zainal Abidin, N. A. (2017). Student's readiness on self-regulated learning implementation for 21 st century learning approaches. *Pertanika Journal of Social Sciences & Humanities, 25*(S), 195–204. https://doi.org/10.1051/matecconf/201815005008

Samruayruen, B., Enriquez, J., Natakuatoong, O., & Samruayruen, K. (2013). Self-regulated learning: A key of a successful learner in online learning environments in Thailand. *Journal of Educational Computing Research, 48*(1), 45-69. https://doi.org/10.2190/ec.48.1.c

Schunk, D. H. (2020). Learning theories: educational perspectives. 8th edition. New York, NY: Pearson. https://doi.org/10.18844/ijlt.v14i3.7888

Shen, D., Cho, M. H., Tsai, C. L., & Marra, R. (2013). Unpacking online learning experiences: Online learning self-efficacy and learning satisfaction. *The Internet and Higher Education, 19*, 10–17. https://doi.org/10.1016/j.iheduc.2013.04.001

Simsek, I., Kucuk, S., Biber, S. K., & Can, T. (2021). Online learning satisfaction in higher education amidst the Covid-19 pandemic. *Asian Journal of Distance Education, 16*(1), 247-261. http://asianjde.com/ojs/index.php/AsianJDE/article/view/561

Smith, P.J., & Betz, N.E. (2000). Development and validation of a scale of perceived social self-efficacy. *Journal of Career Assessment, 8*(3), 283-301. https://doi.org/10.1177/106907270000800306

St Clair, D. (2015). A simple suggestion for reducing first-time online student anxiety. *Journal of Online Learning and Teaching, 11*(1), 129. https://jolt.merlot.org/vol11no1/StClair_0315.pdf

Sun, J. C. Y., & Rueda, R. (2012). Situational interest, computer self-efficacy and self-regulation: Their impact on student engagement in distance education. *British Journal of Educational Technology, 43*(2), 191-204. https://doi.org/10.1111/j.1467-8535.2010.01157.x

Tabak, F., & Nguyen, N. T. (2013). Technology acceptance and performance in online learning environments: Impact of self-regulation. *Technology, 9*(1), 116-130. https://jolt.merlot.org/vol9no1/tabak_0313.htm

Tanya Joosten & Rachel Cusatis (2020) Online learning readiness, *American Journal of Distance Education, 34*:3, 180–193, https://doi.org/10.1080/08923647.2020.1726167

Ten Dam, G., & Volman, M. (2007). Educating for adulthood or for citizenship: social competence as an educational goal. *European Journal of Education, 42*(2), 281-298. https://doi.org/10.1111/j.1465-3435.2007.00295.x

Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. *Review of Educational Research, 45*(1), 89–125. https://doi.org/10.3102/00346543045001089

Torun, E. D. (2020). Online distance learning in higher education: E-learning readiness as a predictor of academic achievement. *Open Praxis, 12*(2), 191–208. https://doi.org/10.5944/openpraxis.12.2.1092

Tsai, C. W., Shen, P. D., & Tsai, M. J. (2020). The effects of college students' technical self-efficacy on their learning satisfaction and learning performance in online learning: The moderator role of gender. *Educational Sciences: Theory and Practice, 20*(4), 32-47.

Tsai, I. C., Tung, I. P., & Laffey, J. (2013). Exploring the impact of students' motivation and self-regulation on the social nature of online learning experiences. *International Journal of Learning Technology, 8*(1), 86–108. https://doi.org/10.1504/ijlt.2013.052833

Tseng, H., Kuo, Y. C., & Walsh, E. J. (2020). Exploring first-time online undergraduate and graduate students' growth mindsets and flexible thinking and their relations to online learning engagement. *Educational Technology Research and Development, 68*(5), 2285-2303. https://doi.org/10.1007/s11423-020-09774-5

Tseng, H., Yeh, H.-T., & Tang, Y. (2019). A close look at trust among team members in online learning communities. *International Journal of Distance Education Technologies, 17*(1), 52–65. https://doi.org/10.4018/ijdet.2019010104

Tseng, H., Yi, X., & Yeh, H. T. (2019). Learning-related soft skills among online business students in higher education: Grade level and managerial role differences in self-regulation, motivation, and social skill. *Computers in Human Behavior, 95*, 179-186. https://doi.org/10.1016/j.chb.2018.11.035

Tyler-Smith, K. (2006). Early attrition among first time eLearners: A review of factors that contribute to drop-out, withdrawal and non-completion rates of adult learners undertaking eLearning

programmes. *Journal of Online learning and Teaching, 2*(2), 73-85. https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=69cbbd78fd52a0644f1acee c6132af8868c07880

Vahedi, M. (2020). The effect of e-learning readiness on self-regulated learning strategies and students' behavioral tendency to web-based learning: The mediating role of motivational beliefs. *Education Strategies in Medical Sciences, 13*(2), 133–142. http://edcbmj.ir/files/site1/user_files_944f39/majidvahedi-A-10-2250-1-3df0199.pdf

Vilkova, K., & Shcheglova, I. (2021). Deconstructing self-regulated learning in MOOCs: In search of help-seeking mechanisms. *Education and information Technologies, 26*, 17-33. https://doi.org/10.1007/s10639-020-10244-x

Wang, C. H., Shannon, D. M., & Ross, M. E. (2013). Students' characteristics, self-regulated learning, technology self-efficacy, and course outcomes in online learning. *Distance Education, 34*(3), 302-323. https://doi.org/10.1080/01587919.2013.835779

Warner, D., Christie, G., & Choy, S. (1998). Readiness of VET clients for flexible delivery including on-line learning. Brisbane: Australian National Training Authority. http://hdl.voced.edu.au/10707/33256

Whipp, J. L., & Chiarelli, S. (2004). Self-regulation in a web-based course: A case study. *Educational technology research and development, 52*(4), 5-21. https://doi.org/10.1007/bf02504714

Wong, J., Khalil, M., Baars, M., de Koning, B. B., & Paas, F. (2019). Exploring sequences of learner activities in relation to self-regulated learning in a massive open online course. *Computers & Education, 140*, 103595. https://doi.org/10.1016/j.compedu.2019.103595

Wozney, L., Venkatesh, V., & Abrami, P. (2006). Implementing computer technologies: Teachers' perceptions and practices. *Journal of Technology and teacher education, 14*(1), 173–207. https://www.learntechlib.org/p/5437/

Yamada, M., Shimada, A., Okubo, F., Oi, M., Kojima, K., & Ogata, H. (2017). Learning analytics of the relationships among self-regulated learning, learning behaviors, and learning performance. *Research and Practice in Technology Enhanced Learning, 12*(1), 1-17. https://doi.org/10.1186/s41039-017-0053-9

Yang C & Xu D (2023) Predicting student and instructor e-readiness and promoting elearning success in online EFL class during the COVID-19 pandemic: A case from China. *PLoS ONE 18*(5): e0284334. https://doi.org/10.1371/journal.pone.0284334

Yavuzalp, N., & Bahcivan, E. (2021). A structural equation modeling analysis of relationships among university students' readiness for e-learning, self-regulation skills, satisfaction, and academic achievement. *Research and Practice in Technology Enhanced Learning, 16*(1), 1–17. https://doi.org/10.1186/s41039-021-00162-y

Yen, C. J., Bozkurt, A., Tu, C. H., Sujo-Montes, L., Rodas, C., Harati, H., & Lockwood, A. B. (2019). A predictive study of students' self-regulated learning skills and their roles in the social network interaction of online discussion board. *Journal of Educational Technology Development and Exchange (JETDE), 11*(1), 2. https://doi.org/10.18785/jetde.1101.02

You, J. W., & Kang, M. (2014). The role of academic emotions in the relationship between perceived academic control and self-regulated learning in online learning. *Computers in Education, 77*, 125–133. https://doi.org/10.1016/j.compedu.2014.04.018

Yu, T. (2018). Examining Construct Validity of the Student Online Learning Readiness (SOLR) Instrument Using Confirmatory Factor Analysis. *Online learning, 22*(4), 277–288. https://doi.org/10.24059/olj.v22i4.1297

Yu, T., & Richardson, J. C. (2015). An exploratory factor analysis and reliability analysis of the Student Online Learning Readiness (SOLR) instrument. *Online Learning, 19*(5), 120– 141. http://dx.doi.org/10.24059/olj.v19i5.593

Yurdugül, H., & Demir, Ö. (2017). An investigation of pre-service teachers' readiness for e-learning at undergraduate level teacher training programs: The case of Hacettepe University. *Hacettepe University Journal of Education, 32*(4), 896–915. https://doi.org/10.16986/HUJE.2016022763

Zhu, Y., Zhang, J. H., Au, W., & Yates, G. (2020). University students' online learning attitudes and continuous intention to undertake online courses: A self-regulated learning

perspective. *Educational Technology Research and Development*, *68*(3), 1485–1519. https://doi.org/10.1007/s11423-020-09753-w

Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In *Handbook of self-regulation* (pp. 13-39). Academic Press. https://doi.org/10.1016/B978-012109890-2/50031-7

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory into Practice, 41*(2), 64–70. http://doi/org/10.1207/s15430421tip4102_2

Zimmerman, B. J. (2008). Investigating self-regulation and motivation: Historical background, methodological developments, and future prospects. *American Educational Research Journal, 45*(1), 166-183. https://doi.org/10.3102/0002831207312909

Zimmerman, B. J., & Moylan, A. R. (2009). Self-regulation: Where metacognition and motivation intersect. In *Handbook of metacognition in education* (pp. 311-328). Routledge.

Zimmerman, B. J., & Schunk, D. H. (Eds.). (2001). *Self-regulated learning and academic achievement: Theoretical perspectives*. Routledge. https://doi.org/10.4324/9781410601032

About the Author(s)

Yan Dai (Corresponding author), yzd0038@auburn.edu, Auburn University, USA, https://orcid.org/0000-0003-1170-7776

Lingfei Luan, luanx040@umn.edu, University of Minnesota Twin Cities, USA, https://orcid.org/0000-0002-8574-6578

Xi Lin, linxi18@ecu.edu, East Carolina University, USA, https://orcid.org/0000-0003-2387-4117

Author's Contributions (CRediT)

Yan Dai: Conceptualization, Data curation, Writing – original draft, Writing – review & editing; Lingfei Luan: Writing – review & editing; Xi Lin: Methodology, Formal Analysis, Writing –review & editing Writing.

Funding

Ethics Statement

Before this research was conducted, approval was obtained from the Institutional Review Boards (IRB) for the Protection of Human Subjects in the Research Office of Auburn University, USA.

Conflict of Interest

The authors do not declare any conflict of interest.

Data Availability Statement

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Suggested citation: