The Role of Self-Regulation in Remote Emergency Learning: Comparing Synchronous and Asynchronous Online Learning

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Abstract: Due to the COVID-19 pandemic, schools and universities across the world have had to switch to online learning, which is offered either synchronously or asynchronously. This study examined the role of self-regulation on students’ performance in each of these modes by comparing the use of self-regulation skills between high and low achievers in each mode and assessing the relationships of using these skills with students’ performance. The data were collected from students who enrolled in a data structures course in fall 2020 in either synchronous or asynchronous mode. The results show that self-regulation is an essential factor for learners’ success in both modes of online learning. However, there was a variance of using self-regulating learning strategies between students in synchronous and asynchronous modes.

Keywords: online learning; synchronous learning; asynchronous learning; self-regulated learning; transactional-distance theory

1. Introduction

The sudden outbreak of COVID-19 forced schools and universities to shut down their campuses and to switch to online classes. According to the United Nations Educational, Scientific, and Cultural Organization (UNESCO) report, by the end of March 2020, school and university closures were enforced in 165 countries; this affected over 1.5 billion learners. Because of that, colleges and universities switched to remote online learning to provide educational continuity to their students. The effectiveness of online learning has been studied for decades, and online education is as effective as or more effective than traditional face-to-face education [1–5].

Traditionally, there are two modes of online learning: synchronous and asynchronous. In synchronous mode, the instructor interacts with students in real time using an audio or video teleconferencing tool. In asynchronous mode, the instructor prepares the educational materials, uploads them online, and makes them available to students to allow them to learn at their own pace [6,7]. Each of these two modes has advantages and limitations. In synchronous online learning, and because of instant communication, students feel less distance from the instructor and peers [8], and more motivated to engage in class participation as a result of monitoring classmates’ reactions to discussion [9]. Students tend to have a better task- and course-completion rate in synchronous than that in asynchronous mode [10]. However, this mode requires reliable and high-speed Internet connections. In addition, it has rigid schedules, and the learning pace is set by the instructor. On the other hand, asynchronous mode offers more flexibility, and students do not need to be online at a specific time—they can learn anytime and anywhere. In fact, people in normal situations enroll in online courses because of their flexibility, as they have other commitments such as work or family [11]. Moreover, this mode allows for students to engage more deeply with the contents [9], and it fits better with students who find that high level of interactivity overwhelming, for example, students in asynchronous mode can stop and rewind the videos, which increases the time for processing the information and decreases the cognitive...
load [12]. Nevertheless, students have more responsibility for their learning, as they lack immediate feedback and interactions with the instructor and peers [8].

The pandemic has created new opportunities for changes in the education sector; one of the changes that should be sustained and improved is promoting the students’ role in their learning. In this study, we aim to understand the role of self-regulation on students’ online learning in both modes, which helps to better utilize online learning in post-COVID-19 era.

Academic self-regulation involves multiple constructs and strategies that include motivation, goal setting, help seeking, task strategies, time management, and self-evaluation. This study compares how students in each mode employ each one of these constructs and strategies and compare the impact of that on their performance. To our knowledge, there is no previous study comparing the role of each individual construct of self-regulation on students’ performance in each mode. Understanding the roles of these constructs in each mode is important for developing successful strategies to promote self-regulation in online learning that fit with the mode of delivery. The research in this paper is guided by the following questions:

1. How do high-achiever students differ from low achievers in terms of using self-regulation strategies in both online-learning modes?
2. What is the relationship between using self-regulation strategies and students’ achievements in both modes?

2. Related Work

The topic of this study has multiple facets. First, it was conducted during the COVID-19 lockdown; the participants were students who enrolled in remote emergency online learning. Second, the students had to enroll in one of the online modes: synchronous or asynchronous. Third, the study is guided by transactional distance theory, and it is based on the self-regulated learning framework. Accordingly, the previous related work includes remote emergency education during COVID-19, the effectiveness of synchronous and asynchronous online learning, and the theoretical frameworks of transactional-distance theory and self-regulation.

2.1. Emergency Remote Learning during COVID-19 Pandemic

The term “emergency remote teaching” (ERT) emerged during the COVID-19 pandemic to distinguish the sudden and compulsory transfer to online learning during this pandemic from the traditional one [13]. Typically, online courses are purposively designed and developed ahead of time, and this requires between six and nine months, but in the case of ERT, schools and universities had to quickly switch to online mode without much preparation. This abrupt transition has brought different challenges to students. They suddenly found their daily life routines entirely altered, so they had to adjust their study time and habits according to this change [14,15]. According to Aguilera [16], students consider studying from home during the COVID-19 pandemic a big challenge because of many distractors such as family members, housework, and noise. They usually associate home with relaxing because they are used to studying in a separate environment from home. This requires students to be more autonomous in terms of time management and environmental structuring, such as arranging a suitable place for study. Another challenge of emergency online learning is the lack of motivation due to the isolation, and the lack of social interactions with peers and instructors [16–18]. Students who have difficulty self-motivating rely more on others to regulate their learning activities [19]; these types of students struggle to cope with the transition to emergency online learning [15].

2.2. Effectiveness of Synchronous vs. Asynchronous Online Learning

Previous studies [12,20–23] compared the synchronous and asynchronous online-learning formats in terms of their impact on students learning and revealed that there was no significant difference between the academic achievements of students who had
attended synchronous and asynchronous online courses. Nieuwoudt [12] found that, regardless of course format, there was a relationship between academic success and the time that students spent online. This time includes attending virtual classes in synchronous mode and watching videos in asynchronous mode. Offir, Lev, and Bezalel [20] found that the important factor to success in both synchronous and asynchronous modes is cognitive ability; students with high cognitive ability are more autonomous, so they take more responsibility for their learning, and they engage more in both synchronous and asynchronous learning processes.

Lee [24] found that the quality of cognitive presence in online learning is positively associated with social presence in both modes. Social presence refers to learners’ sense of belonging to the learning environment. It is an important element for promoting learning interactions, which increases students’ motivation, and facilitates deep learning process. Synchronous learning is usually associated with higher level of social presence because it allows more immediate and intimate interaction comparing to asynchronous mode. However, recent research [25] showed that social presence in asynchronous mode can be facilitated by using emoticons to express emotions during interaction and using audio and video feedback.

2.3. Transactional Distance Theory (TDT)

The transactional-distance theory (TDT) proposed by Dr. Michael Moore [26] provides a pedagogical framework for distance education. The theory states that “distance education is not simply a geographic separation of learners and teachers, but, more importantly, is a pedagogical concept” [26]. The theory assumes that geographical distance causes a communication and psychological gap called “transactional distance”, which separates teacher from learners and may lead to misconceptions between the two.

According to Moore, transactional distance is affected by three factors: dialog, structure, and learner autonomy. Dialog refers to all forms of purposeful interactions that support the learning process. The structure indicates the level of the course’s rigidity or flexibility in terms of objectives, activities, assessments, planned interaction, and the extent to which it accommodates individual learner’s needs. Learner autonomy is the ability of the learner to control and manage their learning in a self-directed way. The theory assumes that transactional distance is determined by the interaction between the three factors. As dialog increases, structure decreases, which results in reducing transactional distance. However, low dialog and high structure result in greater transactional distance. This requires more responsibility from the learner in order to succeed.

2.4. Self-Regulated Learning

There are multiple theoretical models that describe self-regulated learning (SRL) constructs and phases [27]. They commonly describe SRL as a constructive learning process where learners take responsibility for their learning in terms of being active, and controlling their motivation and learning behaviors. Zimmerman and Schunk defined SRL as “the process whereby learners personally activate and sustain cognitions, affects, and behaviors that are systematically oriented toward the attainment of learning goals” [28]. Figure 1 shows the fundamental phases of SRL activities, where learner with self-regulation starts learning activities by setting learning goals and plan the activity in terms of required strategies and time. Then during learning, he arranges the physical environment to avoid distraction, applies the appropriate strategies to learn the subject, manages his time wisely and knows how seek help when needed. Finally, learner evaluates himself, reflect and adapt his strategies accordingly.

Previous studies [29–33] showed that students in traditional learning settings who have self-regulatory abilities achieved better academic performance than that of others who lacked these competencies. SRL skills are more important in online learning settings, as students are more responsible for their learning because of the autonomous nature of online learning and the physical absence of a teacher [34]. Unlike in a face-to-face setting,
where students follow a fixed schedule, learners in an online setting have more flexibility, and they need to determine when and how to study the course contents at their own pace. Online self-regulated learners understand their responsibilities to actively participate in the learning process by regularly accessing course materials, studying them, submitting assignments, self-evaluating, and asking questions when they need help [35]. Previous studies [36,37] found that one of the main reasons for the high dropout rate in online courses is students’ self-regulation failure, as they fail to estimate the required time and efforts to complete learning tasks, and they lack time-management skills, which leads to academic procrastination.

![Figure 1. SRL phases.](image)

Multiple studies explored the role of SRL skills in different types of online learning settings, including massive open online courses (MOOCs) [37–39], blended learning [40], and flipped classrooms [41]. Only one study [42] investigated SRL in the context of emergency remote teaching during COVID-19 and found that SRL strategies are positively related to students’ learning performance. Additionally, students who have SRL skills procrastinate less and need less support in online courses.

This research examines the role of self-regulated learning skills that may impact students’ academic achievements in both modes. Most previous research on comparing synchronous and asynchrony online learning focused on the role of interaction (dialog) on students’ achievements [9,43]. However, our study focuses on the role of learners’ autonomy.

3. Method

3.1. Study Context and Participants

The present study examines the difference in the academic achievements of students who studied the data-structures course during fall 2020 at Qatar University. This is a compulsory course for computer-science and computer-engineering students. The course teaches students how to create and use fundamental data structures such as arrays, trees, hash tables, stacks, queues, heaps, and how to analyze space and time when using these structures in a problem solution. The course was offered concurrently through three sections in the female campus, so all participants were female undergraduate students. Because of COVID-19, all sections were offered online. Two of these sections were offered in synchronous mode at different times, one section had 42 and the other section had 43 students. The students in these sections attended a 50 min lecture online three times a week using Blackboard Collaborate. The third section was offered in a fully asynchronous format, it has 37 students. While all the participants experienced synchronous online learning in spring 2020, it was the first time for students in the asynchronous course to have had this experience. All the contents of the asynchronous mode were prepared ahead
during the previous summer, and included videos, texts, and self-tests. During the study time in fall 2020, the materials were released to the students on a weekly basis, and the students studied these materials at their own pace. The interaction between the students and the instructor in this section was only through discussion forums and emails. The students enrolled in three sections by their choice. The three sections had the same contents and were taught by the same instructor (the first author). They had the same number and type of assessments. All assessments were online except for the final exams, which were held on campus for all three sections.

3.2. Data Sources

The data of this study were collected through the following:

1. Academic Performance

The students’ scores in the final exam were used to represent students’ academic achievements. This assessment was used because it is more reliable than other assessments, as it was held on campus, and the students were proctored during the exam. The final exams for all groups had the same style, number of questions, and level of difficulty.

2. Online Self-Regulated Learning Questionnaire (OLSQ):

The Online Self-Regulated Learning Questionnaire (OLSQ) [44] is a self-report instrument widely used to measure students’ self-regulated learning skills who enrolled in blended or fully online learning settings. This tool is composed of 24 items to assess learner’s skills in 6 subscales, namely, goal setting, environment structuring, task strategies, time management, help seeking, and self-evaluation. One of the shortcomings of this tool is that it does not address the regulation of motivation, which is considered to be an essential aspect of self-regulated learning.

3. Motivated Strategies for Learning Questionnaire (MSLQ):

The MSLQ is also a self-report measure [45] that was developed to measure college students’ self-regulated learning skills in traditional face-to-face settings. The instrument is composed of two parts: the motivational part and the learning-strategy part. They are divided into 5 subscales that have 44 items. The motivational part contains the following scales: intrinsic goal orientation, extrinsic goal orientation, self-efficacy, and test anxiety. The learning strategy part contains the scales of cognitive strategy and self-regulation.

In our study, we only used the motivational part to capture students’ motivational beliefs because this aspect is not considered in OLSQ. Intrinsic goal motivation refers to the learner’s personal interests and enjoyment in the learning process rather than seeking external rewards. On the other hand, extrinsic goal orientation refers to the degree of learner’s participation in the learning process because of external rewards such as grades or recognition. Self-efficacy refers to the learner’s belief or confidence in their ability to successfully perform a learning task. Test anxiety is defined as “a set of cognitive, physiological, and behavioral responses related to concerns about possible failure or poor performance on an exam or a similar evaluative situation” [46].

A survey was prepared composed of the questions in the motivational part of MSLQ in addition to the questions of OLSQ. The data were collected from the students in both modes one week after the end of the semester through Blackboard.

3.3. Data Analysis

We divided the population in each mode into two groups: high and low achievers. We considered students whose scores were less than 70% (less than 14 out of 20 in the final exam) to be low achievers; the rest were high achievers. The two-tailed t-test was used to compare the means of low and high achievers in each mode for every scale of SRL. Additionally, correlation analysis was used to assess the inter-relationship of each scale and students’ performance in each of the four groups: low and higher achievers in asynchronous mode, and low and high achievers in synchronous mode.
4. Results

The descriptive statistics of the students’ performance are presented in Table 1. The number of students who had enrolled in the asynchronous mode was 37 in one section, while the number of students who had enrolled in the synchronous mode was 85, enrolled in two separate sections (N1 = 43, N2 = 42). The t-test result of comparing the performance of the students in the two modes showed no statistically significant difference (t = 0.768, df = 120, \( p = 0.444 \)) in students’ scores between asynchronous (\( M = 13.55, SD = 4.11 \)) and synchronous (\( M = 13.20, SD = 3.77 \)) modes.

|                  | Synchronous | Asynchronous |
|------------------|-------------|-------------|
| N                | 85          | 37          |
| Min              | 4           | 5           |
| Max              | 20          | 20          |
| Mean             | 12.96       | 13.55       |
| Median           | 13.2        | 13.55       |
| SD               | 3.77        | 4.11        |

Figure 2 illustrates the means of students’ response to each scale in the survey. The students in each mode were classified into low and high achievers.

Figure 2. Students’ responses to the survey.

Table 2 shows the comparisons between low and high achievers in each mode based on students’ responses. The table shows the means of students’ responses in each scale, and the result of the \( t \)-test to assess the significance of the difference (at \( p \leq 0.05 \)) between the means. The results in Table 2 reveal multiple differences between low and high achievers. There was a significant difference between high and low achievers (\( p \leq 0.05 \)) in both modes in the following scales: intrinsic goal orientation, self-efficacy, test anxiety, goal setting, and help seeking. The means of high achievers in the aforementioned scales were greater than the means of low achievers except in the test-anxiety scale, where the low achievers reported greater test anxiety than the high achievers did.
Table 2. Difference of using SRL skills between high and low achievers.

|                      | Synchronous |                         | Asynchronous |                         |
|----------------------|-------------|--------------------------|--------------|--------------------------|
|                      | Low | High | p Value | Low | High | p Value |
| N                    | 26  | 59   |         | 12  | 25   |         |
| Intrinsic            | 2.5 | 3.22 | 0       | 2.5 | 3.12 | 0.03    |
| Extrinsic            | 4.43| 4.51 | 0.16    | 4.42| 4.36 | 0.81    |
| Self-efficacy        | 2.56| 3.25 | 0       | 2.5 | 3.33 | 0       |
| Test Anxiety         | 4.28| 3.94 | 0.01    | 4.5 | 3.48 | 0       |
| Goal setting         | 3.31| 3.72 | 0.01    | 3.4 | 3.83 | 0.05    |
| Environment structuring | 3.86 | 3.93 | 0.58    | 3.63| 4.25 | 0       |
| Task strategies      | 3.24| 3.19 | 0.74    | 3.33| 3.35 | 0.94    |
| Time management      | 3.56| 3.56 | 1       | 3.72| 4.41 | 0       |
| Help seeking         | 3.04| 3.5  | 0       | 3.13| 3.67 | 0.01    |
| Self-evaluation      | 2.99| 3.08 | 0.47    | 2.67| 3.18 | 0.03    |

There was no significant difference between low and high achievers in both modes in terms of the extrinsic-goal-orientation and task-strategy scales. However, there was a difference between students in the two modes in terms of the scales of environment structuring, time management, and self-evaluation, where there was no significant difference between low and the high achievers in synchronous mode, but there was a significant difference between them in asynchronous mode.

Table 3 illustrates the correlation of each scale with the students’ performance for the low and the high achievers in each mode. The scales of intrinsic goal orientation, self-efficacy, goal setting, and help seeking were significantly and positively correlated with the performance of the high-achiever students in both modes. On the other side, test anxiety was significantly and negatively correlated with the performance of the high achievers in both modes, in addition to low achievers in synchronous mode only. The time-management and self-evaluation scales were significantly and positively correlated with performance for the high achievers in asynchronous mode only.

Table 3. Correlation between SRL skills and students’ performance.

|                      | Synchronous |                         | Asynchronous |                         |
|----------------------|-------------|--------------------------|--------------|--------------------------|
|                      | Low | High |                      | Low | High |                      |
| N                    | 26  | 59   | 12                   | 25   |        | 0.34 **               |
| Intrinsic            | 0.21| 0.41 *| 0.11                 |        | 0.34 **               |
| Extrinsic            | −0.17| −0.07 | −0.49                 | −0.09 |        |
| Self-efficacy        | −0.09| 0.24 **| 0.2                   |        | 0.4 *                 |
| Test anxiety         | −0.41 *| −0.46 * | −0.24                 | −0.44 *|        |
| Goal setting         | 0.26| 0.37 *| 0.08                 | 0.5   | 0.4 *                 |
| Environment structuring | 0.12 | 0.05 | 0.03                 | 0.19  |        |
| Task strategies      | 0.001| 0.02 | 0.15                 | 0.27  |        |
| Time management      | 0.18| 0.15 | 0.03                 | 0.12  | 0.40 *                 |
| Help seeking         | −0.17| 0.32 | 0.1                  | 0.59 *|        |
| Self-evaluation      | −0.01| −0.13 | 0.15                 | 0.38 **|        |

Note: ** p < 0.10, * p < 0.05.
5. Discussion

Similar to the research in [12,20], here, we identify student-related characteristics that impact students’ achievements regardless of online format. According to the transactional-distance theory, autonomy is an important characteristic for online learners to succeed, so in our study, we used self-regulated learning as the framework to identify learner autonomy. Our study extends previous works reviewed in [47], which examined the role of SRL on learner performance in one format (synchronous or asynchronous) by comparing the role of SRL constructs in each of these modes on learner achievements.

Comparing the self-regulated learning skills of low and high achievers in both modes shows that intrinsic motivation is an essential factor that influences students’ achievements in online learning in both modes. This motivation results from internal reasons such as curiosity or being interested in mastering the content. Our finding confirms the importance of this type of motivation for online learners to ensure sustainable efforts and promote their creativity [48]. On the other hand, results show no significant difference between low and high achievers in both modes in terms of extrinsic motivation. Extrinsic motivation is associated with external reasons such as obtaining good grades, competing with others, or avoiding punishments. Additionally, results indicate that extrinsic motivation had no significant correlation with student performance. Accordingly, our study revealed that intrinsic motivation is more important than extrinsic motivation for online learners to succeed in both modes. This is consistent with the tendency to mainly focus more on intrinsic than extrinsic motivation in online learning settings [49–51].

Moreover, results demonstrated the importance of self-efficacy, goal setting, and help seeking for students to succeed in both modes. This is consistent with the findings in [37,52], which indicated that learners with high self-efficacy had higher performance; our study generalizes this finding to both modes in online learning. Goal setting is another critical factor that influences online learners’ performance. It provides directions for students to finish the learning tasks. This skill includes setting short-term goals, for example, daily or weekly; and long-term goals, such as for the semester. Most previous research investigated the impact of this skill on students’ performance in MOOCs [53,54], and found that completers reported higher use of goal-setting strategies than noncompleters did. Comparing to synchronous mode, goal setting is more important for students in asynchronous mode because this mode is less structured and has less interaction. Students in asynchronous mode have more responsibility to set their goals, plan their learning activities, and maintain high levels of commitment to reach the goals in order to stay on track. Indeed, this requires other SRL constructs, including time management and self-evaluation, to ensure achieving the goals. Help seeking is an essential skill for high achievers in both modes. The current study confirmed the previous finding in [55] that higher achievement is associated with better utilization of help-seeking strategies. In online environments, students can acquire help through discussion forums, communicating with the instructor, asking other classmates, or searching for information on the web. According to [55], students mostly prefer to receive help from their peers or from the instructor through emails because they may feel that it is more private. Self-tests in our asynchronous mode highly stimulated students to seek help from the instructor to solve some of the questions or to discuss their answers.

Similar to previous studies [56,57] that studied the impact of test anxiety on students’ performance in online settings, our study showed that test anxiety is negatively correlated with academic performance in online learning in both modes. Low achievers reported higher anxiety in both modes. Test anxiety might result in less motivation that ultimately affects students’ success. Moreover, students with test anxiety may make incurious mistakes during testing because of the time constraint.

In terms of physical space, online learners study at home or other places that are different from traditional structured classroom contexts; therefore, they should be able to structure their study-learning environment. They might have different options for a quiet place to access the online course. Although the results in our study show no significant
correlation between this scale and learner performance, high achievers in asynchronous mode rated themselves higher in this scale than low achievers did, while there was no significant difference between students in synchronous mode. This might be because students in asynchronous mode had more flexibility in terms of time than that of their peers in synchronous mode, which led to more options of places to study, so the high achievers utilized these flexibilities better than low achievers did.

Our study revealed no difference between high and low achievers in terms of task strategies in both modes. The results also showed no significant correlation of this scale with students’ performance in both modes. This finding is in contrast with the study in [58], which found that the task strategies of online learners are associated with student performance. This might be because of the difference between the populations in terms of age and culture.

Time management is an important skill for online learners. Previous studies that were reviewed in [47] presented mixed results of the impact of time management on student performance. The results in our study showed no difference between low and high achievers in synchronous mode. However, in asynchronous mode, there was significant difference between the two groups. Moreover, time management was positively and significantly correlated with high achievers’ performance in asynchronous mode. This is because time management is more critical for learners in asynchronous mode, and they are more obliged to manage their study time than those in synchronous mode are, who have a fixed schedule of lectures.

Self-evaluation is another important skill for self-regulated learners. At the end of a learning task, they need to assess their progress against the goals that they initially set. On that basis, they might need to adjust their strategies to improve their learning process. Our study revealed that self-evaluation is only significantly correlated with the performance of high achievers in the asynchronous mode. Students in asynchronous mode are usually less certain of their progress, so they want to test themselves in order to ensure that they understand the subject. Thus, the course design should provide opportunities for students to test themselves. In our study, high achievers in asynchronous mode submitted 87% of the self-tests, compared to only 48% for the low achievers.

Overall, the findings in our study support transactional-distance theory. Students who have better self-regulated learning skills perform better than others can in both modes. Because interaction is less in the asynchronous mode, high-achiever students in this mode were more autonomous compared to their peers in synchronous mode in terms of environment-structuring, time-management, and self-evaluation scales.

6. Limitations and Future Work

This study has some limitations, so the findings should be interpreted with caution. The study compares online learning modes during the pandemic period. The participants in this study were students who had enrolled in online learning because of the COVID-19 pandemic, and the traditional mode was not an available option for them. This situation was associated with multiple challenges for the students, including psychological ones, such as stress, being worried about getting sick, or losing a family member. Additionally, environmental challenges that resulted from lockdown restrictions negatively impacted students’ motivation and their cognitive engagement [16].

Moreover, the sample size of the participants was small, especially for asynchronous mode, and all students were female and represented one course at a particular university. Hence, the generalization of the findings is limited. Future work could include conducting the study in a normal situation and compare students’ performance in both online modes in addition to the performance of students who had enrolled in traditional face-to-face mode. Future studies could also have a larger sample size that includes a wider range of courses and universities, and both sexes in order to generalize the findings.
7. Conclusions

The results of this study indicated no significant difference between the two modes in terms of students’ academic achievements. Furthermore, results found significant difference between high and low achievers in both modes in the following self-regulated skills: intrinsic goal orientation, self-efficacy, test anxiety, goal setting, and help seeking. There was no significant difference between low and high achievers in both modes in extrinsic goal orientation and environment structuring. Only in asynchronous mode was there a significant difference between high and low achievers in the following skills: environment structuring, time management, and self-evaluation. Significant and positive correlation was found between the performance of high achievers in both modes and the following skills: intrinsic goal orientation, self-efficacy, goal setting, and help seeking. Test anxiety had significant and negative correlation with high achievers in both modes. Only the performance of the high achievers in asynchronous mode was significantly and positively associated with time management and self-evolution. Generally, self-regulation is an essential factor for learners’ success in both modes of online learning; therefore, utilizing strategies to promote its skills should be considered when designing an online course.

This study revealed that, regardless of online delivery mode, self-regulated students perform better than others do in online learning. This is consistent with transactional-distance theory that considers learner autonomy to be an important factor to reduce transactional distance in online learning. Previous research demonstrated that self-regulated learning skills are teachable and can be improved through training and self-reflection [38,59,60] or through utilizing educational tools [61]. Accordingly, designing online courses should involve some strategies to promote learners’ self-regulated learning skills in order to improve their autonomy, which ultimately enhances their success.

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References
1. Soffer, T.; Nachmias, R. Effectiveness of learning in online academic courses compared with face-to-face courses in higher education. J. Comput. Assist. Learn. 2018, 34, 534–543. [CrossRef]
2. Nguyen, T. The Effectiveness of Online Learning: Beyond No Significant Difference and Future Horizons. MERLOT J. Online Learn. Teach. 2015, 11, 309–319.
3. Paul, J.; Jefferson, F. A Comparative Analysis of Student Performance in an Online vs. Face-to-Face Environmental Science Course From 2009 to 2016. Front. Comput. Sci. 2019, 1, 1. [CrossRef]
4. Abdous, M.; Yoshimura, M. Learner outcomes and satisfaction: A comparison of live video-streamed instruction, satellite broadcast instruction, and face-to-face instruction. Comput. Educ. 2010, 55, 733–741. [CrossRef]
5. Neuhauser, C. Learning Style and Effectiveness of Online and Face-to-Face Instruction. Am. J. Distance Educ. 2002, 16, 99–113. [CrossRef]
6. Kunin, M.; Julliard, K.; Rodriguez, T.E. Comparing Face-to-Face, Synchronous, and Asynchronous Learning: Postgraduate Dental Resident Preferences. J. Dent. Educ. 2014, 78, 856–866. [CrossRef]
7. Öztok, M.; Zingaro, D.; Brett, C.; Hewitt, J. Exploring asynchronous and synchronous tool use in online courses. Comput. Educ. 2013, 60, 87–94. [CrossRef]
8. Francescucci, A.; Rohani, L. Exclusively Synchronous Online (VIRI) Learning: The Impact on Student Performance and Engagement Outcomes. J. Mark. Educ. 2018, 41, 60–69. [CrossRef]
9. Watts, L. Synchronous and Asynchronous Communication in Distance Learning: A Review of the Literature. Q. Rev. Distance Educ. 2016, 17, 23–32.
10. Hrastinski, S. How Do e-Learners Participate in Synchronous Online Discussions? Evolutionary and Social Psychological Perspectives. In Machine Learning Models and Algorithms for Big Data Classification; Springer: Cham, Switzerland, 2010; Volume 24, pp. 119–147.
11. Hrastinski, S. Management of Asynchronous and Synchronous E-Learning. Educ. Q. 2008, 31, 51–55. [CrossRef]
12. Nieuwoudt, J.E. Investigating synchronous and asynchronous class attendance as predictors of academic success in online education. Australas. J. Educ. Technol. 2020, 2020, 15–25. [CrossRef]
13. Hodges, C.; Moore, S.; Lockee, B.; Trust, T.; Bond, A. The Difference Between Emergency Remote Teaching and Online Learning. Educ. Rev. 2020, 27, 1–9. Available online: https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning (accessed on 2 July 2020).
14. Rajab, M.H.; Gazal, A.M.; AlKattan, K. Challenges to Online Medical Education During the COVID-19 Pandemic. Cureus 2020, 12, e8966. [CrossRef]
15. Besser, A.; Flett, G.L.; Zeigler-Hill, V. Adaptability to a sudden transition to online learning during the COVID-19 pandemic: Understanding the challenges for students. Sch. Teach. Learn. Psychol. 2020. [CrossRef]
16. Aguilera-Hermida, A.P. College students’ use and acceptance of emergency online learning due to COVID-19. Int. J. Educ. Res. Open 2020, 1, 100011. [CrossRef]
17. Shin, M.; Hickey, K. Needs a little TLC: Examining college students’ emergency remote teaching and learning experiences during COVID-19. J. Furth. High. Educ. 2020, 1–14. [CrossRef]
18. Ferri, F.; Grifoni, P.; Guzzo, T. Online Learning and Emergency Remote Teaching: Opportunities and Challenges in Emergency Situations. Societies 2020, 10, 86. [CrossRef]
19. Tichavsky, L.P.; Hunt, A.; Driscoll, A.; Jicha, K. “It’s Just Nice Having a Real Teacher”: Student Perceptions of Online versus Face-to-Face Instruction. Int. J. Sch. Teach. Learn. 2015, 9, 2. [CrossRef]
20. Offir, B.; Lev, Y.; Bezalel, R. Surface and deep learning processes in distance education: Synchronous versus asynchronous systems. Comput. Educ. 2008, 51, 1172–1183. [CrossRef]
21. Somenarain, L.; Akkaraju, S.; Gharbaran, R. Student perceptions and learning outcomes in asynchronous and synchronous online learning environments in a biology course. Sch. Teach. Learn. Psychol. 2020, 10, 86. [CrossRef]
22. Roblyer, M.; Freeman, J.; Donaldson, M.B.; Maddox, M. A comparison of outcomes of virtual school courses offered in synchronous and asynchronous formats. Internet High. Educ. 2007, 10, 261–268. [CrossRef]
23. Olson, J.S.; McCracken, F.E. Is It Worth the Effort? The Impact of Incorporating Synchronous Lectures into an Online Course. Online Learn. 2014, 19, 2. [CrossRef]
24. Lee, S.-M. The relationships between higher order thinking skills, cognitive density, and social presence in online learning. Internet High. Educ. 2014, 21, 41–52. [CrossRef]
25. Andel, S.A.; de Vreede, T.; Spector, P.E.; Padmanabhan, B.; Singh, V.K.; de Vreede, G.-J. Do social features help in video-centric online learning platforms? A social presence perspective. Comput. Hum. Behav. 2020, 113, 106505. [CrossRef]
26. Moore, M.G. The theory of transactional distance. In Handbook of Distance Education, 4th ed.; Keegan, D., Ed.; Routledge: London, UK, 1993; pp. 32–46.
27. Panadero, E. A Review of Self-regulated Learning: Six Models and Four Directions for Research. Front. Psychol. 2017, 8, 422. [CrossRef]
28. Schunk, D.H.; Zimmerman, B. Handbook of Self-Regulation of Learning and Performance; Routledge: London, UK, 2011.
29. Zimmerman, B.J.; Bandura, A. Impact of Self-Regulatory Influences on Writing Course Attainment. Am. Educ. Res. J. 1994, 31, 845–862. [CrossRef]
30. Dent, A.L.; Koenka, A.C. The Relation between Self-Regulated Learning and Academic Achievement across Childhood and Adolescence: A Meta-Analysis. Educ. Psychol. Rev. 2015, 28, 425–474. [CrossRef]
31. Vukman, K.B.; Licardo, M. How cognitive, metacognitive, motivational and emotional self-regulation influence school performance in adolescence and early adulthood. MERLOT J. Online Learn. Teach. 2010, 6, 353–356.
32. Roblyer, M.; Freeman, J.; Donaldson, M.B.; Maddox, M. A comparison of outcomes of virtual school courses offered in synchronous and asynchronous formats. Internet High. Educ. 2007, 10, 261–268. [CrossRef]
33. Moore, M.G. The theory of transactional distance. In Handbook of Distance Education, 4th ed.; Keegan, D., Ed.; Routledge: London, UK, 1993; pp. 32–46.
34. Panadero, E. A Review of Self-regulated Learning: Six Models and Four Directions for Research. Front. Psychol. 2017, 8, 422. [CrossRef]
35. Schunk, D.H.; Zimmerman, B. Handbook of Self-Regulation of Learning and Performance; Routledge: London, UK, 2011.
36. Zimmerman, B.J.; Bandura, A. Impact of Self-Regulatory Influences on Writing Course Attainment. Am. Educ. Res. J. 1994, 31, 845–862. [CrossRef]
37. Dent, A.L.; Koenka, A.C. The Relation between Self-Regulated Learning and Academic Achievement across Childhood and Adolescence: A Meta-Analysis. Educ. Psychol. Rev. 2015, 28, 425–474. [CrossRef]
38. Vukman, K.B.; Licardo, M. How cognitive, metacognitive, motivational and emotional self-regulation influence school performance in adolescence and early adulthood. MERLOT J. Online Learn. Teach. 2010, 6, 353–356. [CrossRef]
39. Hacker, D.; Bol, J.L.; Horgan, D.D.; Rakow, E.A. Test prediction and performance in a classroom context. J. Educ. Psychol. 2000, 92, 160–170. [CrossRef]
40. Mengo, C.; Ronconi, L.; De Beni, R. What makes a good student? How emotions, self-regulated learning, and motivation contribute to academic achievement. J. Educ. Psychol. 2014, 106, 121–131. [CrossRef]
41. Lehmann, T.; Hähnlein, I.; Ifenthaler, D. Cognitive, metacognitive and motivational perspectives on preselection in self-regulated online learning. Comput. Hum. Behav. 2014, 32, 313–323. [CrossRef]
42. You, J.W. Identifying significant indicators using LMS data to predict course achievement in online learning. Internet High. Educ. 2016, 29, 23–30. [CrossRef]
43. Lee, Y.; Choi, J. A review of online course dropout research: Implications for practice and future research. Educ. Technol. Res. Dev. 2011, 59, 593–618. [CrossRef]
44. Cho, M.-H.; Shen, D. Self-regulation in online learning. Distance Educ. 2013, 34, 290–301. [CrossRef]
45. Wong, J.; Baars, M.; Davis, D.; Van Der Zee, T.; Houben, G.-J.; Paas, F. Supporting Self-Regulated Learning in Online Learning Environments and MOOCs: A Systematic Review. Int. J. Hum. Comput. Interact. 2019, 35, 356–373. [CrossRef]
39. Littlejohn, A.; Hood, N.; Milligan, C.; Mustain, P. Learning in MOOCs: Motivations and self-regulated learning in MOOCs. *Internet High. Educ.* 2016, 29, 40–48. [CrossRef]
40. Zhu, Y.; Au, W.; Yates, G. University students’ self-control and self-regulated learning in a blended course. *Internet High. Educ.* 2016, 30, 54–62. [CrossRef]
41. Shih, M.; Liang, J.-C.; Tsai, C.-C. Exploring the role of university students’ online self-regulated learning in the flipped classroom: A structural equation model. *Interact. Learn. Environ.* 2018, 27, 1192–1206. [CrossRef]
42. Pelikan, E.R.; Lüftenegger, M.; Holzer, J.; Korlat, S.; Spiel, C.; Schober, B. Learning during COVID-19: The role of self-regulated learning, motivation, and procrastination for perceived competence. *Z. Erzieh.* 2021, 24, 393–418. [CrossRef] [PubMed]
43. Duncan, K.; Kenworthy, A.; McNamara, R. The Effect of Synchronous and Asynchronous Participation on Students’ Performance in Online Accounting Courses. *Account. Educ.* 2012, 21, 431–449. [CrossRef]
44. Barnard-Brak, L.; Lan, W.Y.; To, Y.M.; Paton, V.O.; Lai, S.-L. Measuring self-regulation in online and blended learning environments. *Internet High. Educ.* 2009, 12, 1–6. [CrossRef]
45. Pintrich, P.R.; Smith, D.; Garcia, T.; McKeachie, W. Reliability and Predictive Validity of the Motivated Strategies for Learning Questionnaire (Msldq). *Educ. Psychol. Meas.* 1993, 53, 801–813. [CrossRef]
46. Bodas, J.; Ollendick, T.H.; Sovani, A.V. Test anxiety in Indian children: A cross-cultural perspective. *Anxiety Stress. Coping* 2008, 21, 387–404. [CrossRef] [PubMed]
47. Broadbent, J.; Poon, W. Self-regulated learning strategies and academic achievement in online higher education learning environments: A systematic review. *Internet High. Educ.* 2015, 27, 1–13. [CrossRef]
48. Zhang, X.; Pi, Z.; Li, C.; Hu, W. Intrinsic motivation enhances online group creativity via promoting members’ effort, not interaction. *Br. J. Educ. Technol.* 2021, 52, 606–618. [CrossRef]
49. Hartnett, M. The Importance of Motivation in Online Learning. In *Motivation in Online Education*; Springer: Singapore, 2016; pp. 5–32. ISBN 9789811007002.
50. Shroff, R.H.; Vogel, D.R. Assessing the Factors Deemed to Support Individual Student Intrinsic Motivation in Technology Supported Online and Face-to-Face Discussions. *J. Inf. Technol. Educ. Res.* 2009, 8, 059–085. [CrossRef]
51. Chyung, S.Y.; Moll, A.J.; Berg, S.A. The role of intrinsic goal orientation, self-efficacy, and e-learning practice in engineering education. *J. Eff. Teach.* 2010, 10, 22–37.
52. Yokoyama, S. Academic Self-Efficacy and Academic Performance in Online Learning: A Mini Review. *Front. Psychol.* 2019, 9, 2794. [CrossRef]
53. Handoko, E.; Gronseth, S.L.; McNeil, S.G.; Bonk, C.J.; Robin, B.R. Goal Setting and MOOC Completion. *Int. Rev. Res. Open Distrib. Learn.* 2019, 20. [CrossRef]
54. Kizilcec, R.F.; Pérez-Sanagustin, M.; Maldonado, J.J. Self-regulated learning strategies predict learner behavior and goal attainment in Massive Open Online Courses. *Comput. Educ.* 2017, 104, 18–33. [CrossRef]
55. Mahasneh, R.A.; Sowan, A.K.; Nassar, Y.H. Academic Help-Seeking in Online and Face-To-Face Learning Environments. *E-Learn. Digit. Media* 2012, 9, 196–210. [CrossRef]
56. Joo, Y.J.; Lim, K.Y.; Kim, S.M. A model for predicting learning flow and achievement in corporate e-learning. *Educ. Technol. Soc.* 2012, 15, 313.
57. Yang, Y.; Cao, L. The Role of Learner Self-Efficacy in Online Test Anxiety and Help-Seeking among College Students. In *Self-Efficacy in Instructional Technology Contexts*; Springer International Publishing: Cham, Switzerland, 2018; pp. 35–55.
58. Broadbent, J. Comparing online and blended learner’s self-regulated learning strategies and academic performance. *Internet High. Educ.* 2017, 33, 24–32. [CrossRef]
59. Alhazbi, S. Using e-journaling to improve self-regulated learning in introductory computer programming course. In Proceedings of the 2014 IEEE Global Engineering Education Conference (EDUCON), Istanbul, Turkey, 3–5 April 2014; pp. 352–356.
60. Lin, J.-W. Effects of an online team project-based learning environment with group awareness and peer evaluation on socially shared regulation of learning and self-regulated learning. *Behav. Inf. Technol.* 2018, 37, 445–461. [CrossRef]
61. Pérez-Alvarez, R.; Maldonado-Mahauad, J.; Pérez-Sanagustin, M. Tools to Support Self-Regulated Learning in Online Environments: Literature Review. In *Lifelong Technology-Enhanced Learning*; Springer International Publishing: Cham, Switzerland, 2018; Volume 11082, pp. 16–30.