Procrastination Awareness and Learning Behavioral Types in an Online Learning Environment

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Abstract

Due to the impact of novel coronavirus (COVID-19), reliance on the online learning environment has expanded rapidly. The subject of students' self-regulated learning skills in an online environment has been attracting attention, along with the same in a face-to-face environment. This research investigates the relationship between students' self-regulated learning awareness and actual learning behavior. Twenty-six students participated in our study and were asked to study a series of practices using online test of English for international communication (TOEIC) courseware in Japan. Their learning data were analyzed to describe their learning behavior. The result was that their learning behaviors were categorized into seven types. Additionally, two questionnaires were conducted to collect data about the students' psychological state. The result showed that one-third of the students were procrastinators and that it was the procrastination avoidance factor that mainly divided the learning behavioral types.

Keywords: online learning environment, learning behavior, self-regulated learning, procrastination, foreign language learning

1 Introduction

The spread of novel coronavirus (COVID-19) has led to the expansion of reliance on online teaching in education settings. The online environment widely utilized since the onset of the COVID-19 pandemic differs from online education implemented in traditional environments in terms of its urgency and social and psychological impact [1]. Unlike face-to-face classroom environments, it is impossible for teachers to directly instruct students and for learners to engage with each other. Thus, students' attitudes toward learning play an important role in distance online environments. The discussion has been extended to the COVID-19 pandemic situation. Self-regulated learning (SRL) requires that learners control themselves to facilitate autonomous learning. SRL is considered to be related to learners' motivation, cognition, and self-control, which are necessary to achieve learning goals [2] [3]. However, the importance of SRL has not been well focused on in COVID-19 times on the basis of students' learning behavioral data. Additionally, while SRL is required in learning, more than 70% of learners engage in procrastination behavior until they feel the urgent need for learning [4]. This is problematic for instructors conducting online distance courses, since in an online distance learning environment, it is more difficult to directly instruct, encourage, and consult with students. Additionally, learners require various distance SRL skills to cope with the stress and fatigue that may accompany the undertaking of online distance courses [5].

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This paper discusses how students cope with distance SRL using online foreign language learning courseware, with a special focus on learners' procrastination behaviors while undertaking a 15-week compulsory foreign language course at a Japanese national university. This study collected weekly learning log data on progress through and the completion of lessons using the courseware. The aim of this research was to investigate how students cope with their procrastination and identify the associated psychological factors. This paper reviews basic SRL and procrastination theories, followed by learning behavioral types observed in an online learning environment. To analyze the relationship between learning behavior and students' psychological state, cluster analysis, ANOVA analysis, and tree analysis were used. It was found that negative procrastination awareness determines students' learning behavior, that is, whether a student is a procrastinator.

2   Previous Studies

2.1   Self-Regulated Learning in an Online Learning Environment

Many studies have described the importance of SRL as a learning strategy. SRL is among the key concepts in a learning environment design that fosters autonomous learners [6]. [7] proposed a three-phase model of SRL and stated that SRL awareness is important in three phases: performance or volitional control, self-reflection, and forethought. According to [8], learners with SRL awareness are able to adapt through self-control and self-evaluation. Other studies have shown that SRL is strongly related to metacognition, which fosters a sense of responsibility for learning goals [7] [9]. As these previous studies have shown, high SRL awareness promotes autonomous learning. Thus, SRL positively impacts learning effectiveness and learning outcomes. These studies have demonstrated the importance of SRL in face-to-face learning environments, and there has generally been little research on online environments. However, [10] found that the importance of SRL in an online environment is comparable to that in a face-to-face environment. [10] noted the importance of time management skills at all three stages of SRL. Moreover, [11] pointed out that negative attitudes toward ICT use are related to goal setting, time management, help-seeking, and self-regulation. It has been suggested that SRL is essential to promote positive learning behaviors and outcomes in an online environment. Additionally, [11] stressed that time management is a crucial factor to foster SRL awareness and skills, as to take SRL-based learning actions, it is important to set clear goals and efficiently manage time. Thus, learners who lack SRL awareness may be procrastinators. Therefore, it can be said that SRL and procrastination are closely related.

2.2   Nature of Procrastination

Procrastination is defined as the lack or absence of self-regulated performance and the behavioral tendency to postpone what is necessary to reach a goal [12] [13]. When an assignment is given in class, procrastinators postpone their assignment until the deadline is close, at which time they attempt to acquire all the necessary knowledge at once, as opposed to starting the assignment early and regularly working on it. Procrastination is considered a problematic learning behavior because procrastinators cannot control their SRL awareness, which hinders their ability to gain an overview of the learning outcomes. Over 70% of college students postpone their tasks until they feel the need to struggle with the tasks [14]. Additionally, according to [12], up to 95% of students may, in fact, be procrastinators [14]. Procrastination behavior has been observed not

only in students but has also been found to be widespread among adults [15] [16]. Hence, management skills for procrastination seem to be key to successful lifelong learners.

Over time, procrastination has come to be considered an undesirable learning behavior. Procrastination has long been regarded as laziness or self-indulgent behavior attributable to a lack of self-regulation [17]. In contrast with procrastinators, non-procrastinators are associated with high efficacy and productivity and are seen as highly-motivated to perform (e.g., [12] [18]). Thus, procrastination was regarded as a negative behavior in the learning context. However, [19] put forward a different view about procrastination, suggesting that procrastination can lead to some benefits, such as short-term stress reduction. Furthermore, if the procrastinator enjoys performing under pressure, they can complete their tasks more efficiently when the deadline is near.

Procrastination behavior is related to time management, affective, cognitive, and behavioral components [20]. [19] distinguished the procrastinator in terms of the cognitive, affective, and behavioral dimensions. Based on multi-factor procrastination, [19] defined two types of procrastinators: the passive procrastinator and the active procrastinator. Passive procrastinators embody the traditional sense of a procrastinator. They procrastinate aimlessly, and they cannot control their learning behavior in relation to achieving desirable learning outcomes. In contrast, active procrastinators are capable of timely decision-making [19]. These two types of procrastinators differ in terms of their reason for procrastinating. Specifically, even if the deadline is the same, and both procrastinators put off their assignment until the deadline is upon them, their learning motivations differ, and their outcomes could also be different. Active procrastinators postpone their assignments for some reasons, such as time management in an attempt to accommodate other tasks or a preference for working under temporal pressure. This type of procrastinator has a positive reason to postpone task engagement. In contrast, passive procrastinators are cavalier about not completing their assignments. Therefore, procrastination can be either negative or positive in general.

Regarding the relationship between time engagement and procrastination, [21] proposed a 2 x 2 model that divides mental states and actual learning behaviors into four types: procrastination–approach (PAp), procrastination–avoidance (PAv), timely engagement–approach (TEAp), and timely engagement–avoidance (TEAv). PAp is a learning strategy characterized by intentional procrastination that entails postponing, while PAv is unintentional and unconscious procrastination. Generally, PAv leads to undesirable outcomes and is associated with "SRL failures" [6]. TEAp is the result of time management through positive motivational control. In contrast, TEAv is a learning behavior characterized by time management based on avoidance motivation. Of these four types, those who exhibit PAp can be viewed as active procrastinators, and those who exhibit PAv can be classed as passive procrastinators.

2.3   Learning Behavioral Types

In traditional procrastination research, self-report measures were used to analyze procrastination among learning behaviors. However, it is generally assumed that self-report measures lack reliability and validity. [14] classified learning behavioral types based on actual learning behaviors instead of self-report measures and investigated the details of procrastination. The results revealed seven possible learning behavioral types: (a) procrastination, (b) learning habit, (c) random, (d) diminished drive, (e) early bird, (f) chevron, and (g) catch-up. Details of each are as follows. (a) Procrastination is a type of learning behavior that [14] proposed in a new taxonomy with particular validity and reliability. Procrastination is characterized by postponement and

rushed coursework, entailing refraining from doing assignments until the deadline. Procrastinators are inclined to take an efficiency-oriented approach to assignments. (b) Regarding learning habit, study habits are well established, and learning effects are relatively high. (c) People who fall into the random category are affected by internal factors such as mood and motivation, as well as external factors such as part-time jobs and examinations. (d) Under the diminished drive type, individuals are motivated at first, but their motivation declines over time and does not sustain the learning behavior. (e) The early bird type includes people who complete tasks early. Such persons may be cautious and performance or goal oriented. (f) The learning behavior of the chevron type follows a mountain shape. People of this type try hard at the middle stage, but the learning behavior does not continue. The decreased effort can be attributed to the prospect of completing the task. (g) The catch-up type starts slow but increases their pace in the middle, gradually catching up to an appropriate pace. [22] suggested that self-reported measures of procrastination are often weak measures of actual procrastination. Thus, classification based on actual learning behavior would be more objective. However, [14] did not discuss the relationship between actual learning behaviors and underlying psychological factors. The present study focuses on this relationship, with a particular focus on procrastination awareness.

2.4   The Distance Learning Environment Amidst the COVID-19 Pandemic

Since the onset of the COVID-19 pandemic, many market environments have changed significantly. The educational environment is among the industries affected by COVID-19, as traditional face-to-face teaching became difficult. Amidst the COVID-19 pandemic, online education began to be used as an alternative to face-to-face teaching. This change in the learning environment posed a challenge for both teachers and learners. Given the differences inherent in online education in the troublous climate created by the spread of an unfamiliar virus, learners have reported experiencing social isolation and learning anxiety and have faced newly created barriers to their learning motivation [23]. The urgency associated with the online environment has removed the possibility of due consideration for learners. When traditional face-to-face lectures were no longer available, universities attempted to compensate for students' attendance of lectures, and in many cases, end-of-term exams as well, with reports and other assignments. These alternative assignments placed a heavy burden on university students and increased learners' cognitive overload [23]. It was also difficult for learners to receive adequate support from teachers and schools in an emergency online environment [24]. Learners' learning behavior in the online environment necessitated by COVID-19 actually occurs in a different psychological state compared to the learning environment provided by traditional online learning. This phenomenon necessitates research on SRL under the context of the post-COVID-19 distance online learning.

3   Research

3.1   Purpose and Research Questions

In this research, actual learning behavior was investigated to discuss the relationship between procrastination and learners' psychological state. The present study addressed the following two research questions:

RQ 1: Which learning behavioral types are observed in an online learning environment?

RQ 2: Which psychological factors are related to actual learning behaviors?

This research was conducted in a distance online learning environment, with the goal of providing new insights into the psychological impact on learners and their actual learning behaviors.

3.2 Procedure

This research utilized a mandatory online language learning course at a national university in Japan. The course was provided for university freshmen for a duration of 15 weeks. Weekly lectures were offered via synchronous online classes, and students were given fully-online assignments for this project that were unrelated to their classes' content. Specifically, these assignments were completely independent of the class, and students were not given time to engage with them during classes. In this research, a class comprising international studies students ($n = 26$) was analyzed. Their TOEIC scores ranged from 575 to 670. Assignments were given over 15 weeks, and students were required to complete all lessons on the designated courseware, namely ALC NetAcademy Next's TOEIC 730-Toppa course, which is designed to help students achieve a TOEIC score above 730. The assignments aimed to improve students' language skills and increase their TOEIC score. The courseware comprises target description, exercise, and training, but the assignment in this study was only to complete the target and exercise stages. There are 78 units, including listening and reading sections. At the target stage, students are expected to learn specific points to prepare for the test, and at the exercise stage, they practice questions in the actual test format. To analyze actual learning behavior, assignment log data as well as students' learning times were collected. These data accumulated weekly, and individual learning times were visualized on a timeline. Students were informed that additional points would be added to their final grade based on the degree of completion of the assignments.

Data on the students' psychological state were collected via two questionnaires, as [25] and [21] proposed. [25] developed the Motivated Strategies for Learning Questionnaire (MSLQ) instrument, which comprises five factors: self-efficacy (SE), internal value (IV), cognitive strategies (CS), self-regulation (SR), and test anxiety (TA). The questionnaire comprises 44 items rated on a seven-point Likert scale. The MSLQ was used to measure the students' SRL skills. Another questionnaire employed in this study is the time-related academic behavior scale based on the 2 x 2 model [21] developed. It consists of 22 items across four factors: PAp, PAv, TEAp, and TEAv. Students answered each item on a seven-point Likert scale. The students completed both questionnaires during the first class.

Regarding data collection, the platform on which the assignment was hosted has a function that allows administrators to check students' progress and the number of hours individual students spend on each learning unit. Students were instructed to complete the task at an appropriate learning pace, that is, almost six units per week. This pacing assumed completion of all tasks two weeks before the deadline. The students were expected to learn the materials in a self-regulated manner, and they were not given time to study the materials or discuss the assignment with their classmates during the class. The actual number of completed units was counted weekly, but for the analysis, this measure was taken once every three weeks. The students' actual learning behaviors were categorized according to the learning behavioral types [14] proposed.

3.3 Results

All 26 students enrolled in the course completed two questionnaires, as previously mentioned, and comprehensive actual learning behavioral data were collected. The answer to RQ1 is illustrated in Figure 1 below.
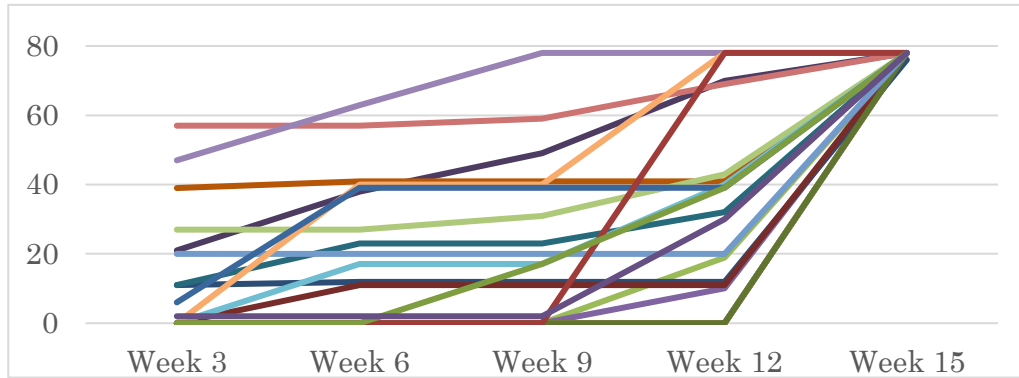

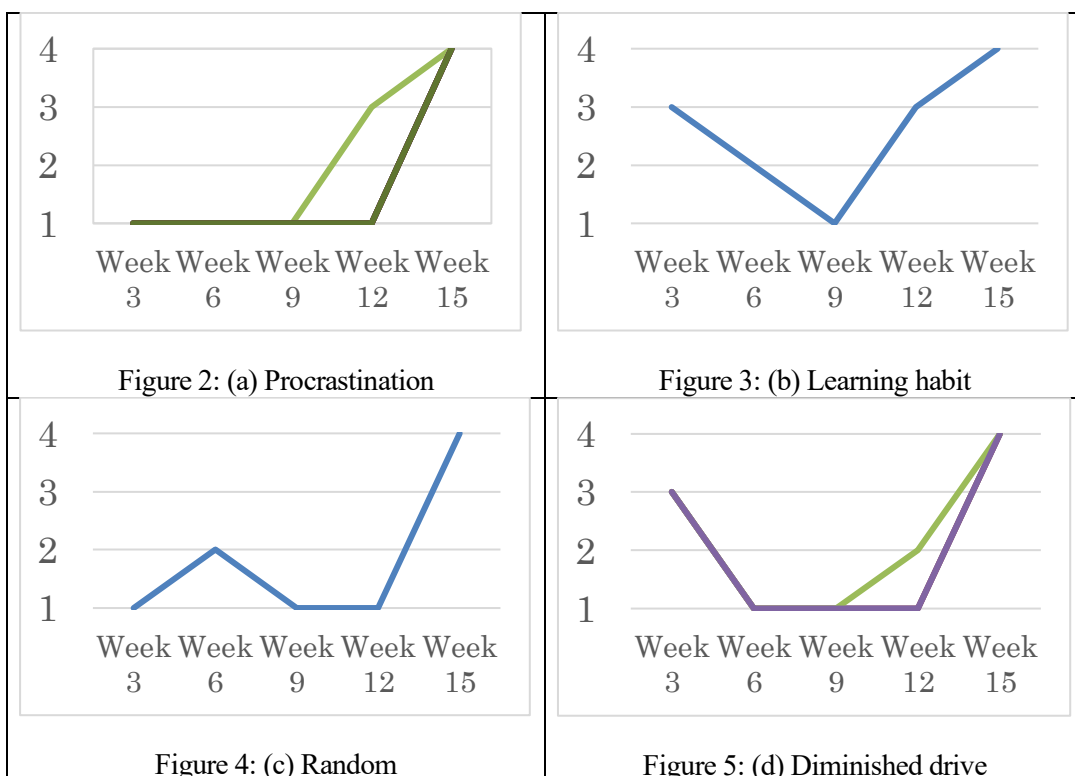
Figure 1: All participants' learning behavior

Figure 1 shows all students' learning methodologies as documented every three weeks. The increases in learning pace and learning volume observable within Weeks 12–15 are overwhelming compared with before this period of time. By Week 12, only three students had completed the assigned tasks. Based on the characteristics of actual learning procedure, the behaviors were categorized into seven types, based on [14]. Table 1 shows the number of students categorized into each learning type and their task completion ratios. Students categorized as "other" did not access the learning materials at all or only did so for a short period. Consequently, their learning data could not be collected, and we labeled them as "other" and excluded them from further analysis. Table 1 shows that almost one-third of the students were procrastinators, and a minority of the students were categorized as of the learning habit, random, or early bird type. Additionally, except for those students classified as "other," 22 students completed the task by the end of the study.
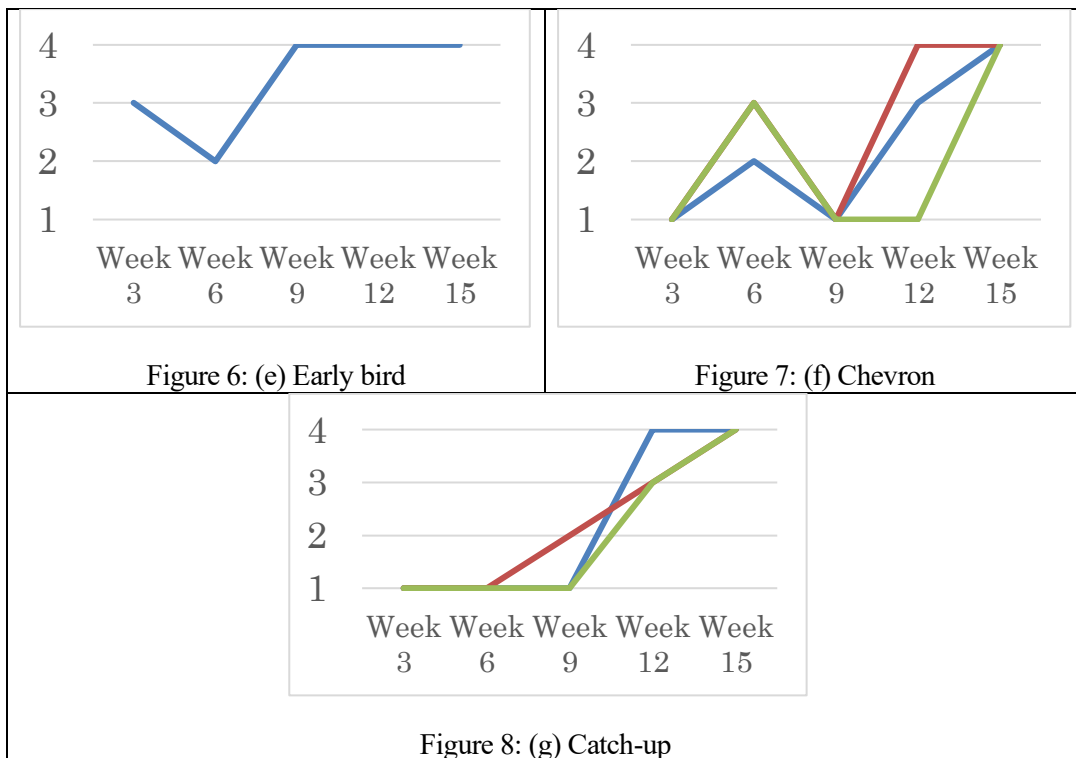
Table 1: Learning types and their task completion ratios

	Learning behavioral type	Total		Task completed		Not completed	
		n	%	*n*	%	*n*	%
1	Procrastination	9	34.62	9	100.00	0	0.00
2	Learning habit	1	3.85	1	100.00	0	0.00
3	Random	1	3.85	1	100.00	0	0.00
4	Diminished drive	4	15.38	4	100.00	0	0.00
5	Early bird	1	3.85	1	100.00	0	0.00
6	Chevron	3	11.54	3	100.00	0	0.00
7	Catch-up	3	11.54	3	100.00	0	0.00
-	Other	4	15.38	0	0.00	4	100.00
	Total	26	100.00	22	84.62	4	15.38

The learning procedures for each type is shown in Figures 2–8. The vertical scale shows students' learning pace, as follows: 1 = slow, 2 = appropriate, 3 = fast, 4 = achieved completion. Figure 2 shows (a) the procrastination type, for whom, with the exception of one student, the students' pace was slow until Week 12. They crammed in the last few weeks and put in a final spurt just

prior to the deadline. This type of student may be characterized as a sluggard or as an efficient learner [14]. Figure 3 shows (b) the learning habit type. Habitual learners' trajectory should follow a horizontal line, but this student dipped at Week 9. This period was end-of-term for almost all other classes. The university's curriculum is based on a three-module system for each semester (spring/autumn semester). Many classes conclude at the end of module two, but the mandatory language learning class in this study employs the three-module system and continues for five more weeks. Thus, these students had many other final exams or final reports around Week 9. Therefore, it was inevitable for their learning pace to decline during that period. At times other than Week 9, the habitual students' learning pace was generally stable. Figure 4 shows (c) the random type. It was predicted that students classified as this type would be affected by their mood or other random factors. Indeed, their learning progress was irregular. Figure 5 shows (d) the diminished drive type. All students of this type exhibited a fast pace in Week 3, but their learning pace approached a slow pace until the deadline drew nearer. This learning pace decline could suggest that the students had the confidence to complete the task during their first bout of progress, but they stopped studying near the deadline. Figure 6 shows (e) the early bird type. Students of this type finished before Week 9, and their learning pace was very fast. This type of student could be considered an SRL learner. Figure 7 shows (f) the chevron type. All students in this category followed a chevron-shaped trajectory, with Week 6 as its apex. This could be because of other classes' final exams/reports in Week 9. With this schedule in mind, these students seemed to activate their SRL skills and appear to have worked on their assignments before preparing for end-of-term exams and reports in Week 9. After Week 9, these students showed a final spurt of studying to meet the deadline. Lastly, Figure 8 shows (g) the catch-up type. Unlike the procrastinators, catch-up students' learning volume increased in Weeks 9–12 rather than immediately prior to the deadline.

Figure 2: (a) Procrastination

Figure 3: (b) Learning habit

Figure 4: (c) Random

Figure 5: (d) Diminished drive

Figure 6: (e) Early bird

Figure 7: (f) Chevron

Figure 8: (g) Catch-up

Regarding RQ2, the completed questionnaires were collected, and the individual average score for each factor was calculated. These data were used for cluster analysis to analyze their relationship with the behavioral types given above. The cluster analysis produced three clusters: Cluster 1 ($n = 11$), Cluster 2 ($n = 9$), and Cluster 3 ($n = 2$). Cluster 1 had higher TEAp and TEAv and lower PAp and Pav, which led us to predict an association with the (d) diminished drive, (e) early bird, (f) chevron, or (g) catch-up type, based on an apparent weak sense of procrastination and superior time management skills among these students. Cluster 2, in contrast to Cluster 1, had low TEAp and TEAv and high PAp and Pav, indicating high procrastination awareness and suggesting an association with the (a) procrastination type. For Cluster 3, unlike Clusters 1 and 2, IV, CS, and SR were overwhelmingly high, indicating high intrinsic motivation and autonomous learning. Moreover, when high TEAp and TEAv and low PAp and PAv were observed, it suggested that these students had the ability to learn according to plan, implying an association with the (b) learning habit type. The actual breakdown of each learning behavioral type for each cluster is shown in Table 2. As shown in the table, procrastination is divided into Clusters 1 and 2, with 66.67% of Cluster 2 showing a strong tendency to postpone tasks. Cluster 1 includes a variety of types, as predicted; the (d) diminished drive, (e) early bird, and (7) catch-up types, who manage their time according to a learning outlook, are classified in this cluster, as shown. Regarding Cluster 3, it is depicted as linked to the (b) learning habit type, which is associated with the promotion of solid learning, and the diminished drive type, which, in this study, comprised students who covered half of the total learning in the first week.

Following the above cluster analysis results, ANOVA analysis was performed to confirm the differences among the clusters. The results showed the correlations given in Table 3 for each psychological factor. No significant values were found for the MSLQ scales, namely SE, IV, TA, CS, and SR, for any of the other factors. Significant differences were confirmed for four variables: TEAp, TEAv, PAp, and PAv.

Table 2: Learning behavioral type ratios by cluster

	Learning behavioral type	Cluster 1		Cluster 2		Cluster 3	
		n	%	*n*	%	*n*	%
1	Procrastination	3	27.27	6	66.67	0	0.00
2	Learning habit	0	0.00	0	0.00	1	50.00
3	Random	1	9.09	0	0.00	0	0.00
4	Diminished drive	2	18.18	1	11.11	1	50.00
5	Early bird	1	9.09	0	0.00	0	0.00
6	Chevron	1	9.09	2	22.22	0	0.00
7	Catch-up	3	27.27	0	0.00	0	0.00
	Total	11	100.00	9	100.00	2	100.00

In particular, we identified three strong correlations: PAv / TEAp ($r = -0.87$), TEAp / TEAv ($r = 0.81$), and PAp / TEAv ($r = -0.74$). Next, we performed decision tree analysis to predict learning behavior based on psychological variables. Cluster 3 was excluded from this analysis; only the four variables for which significant correlations were analyzed. As shown in Figure 9, PAv occupies the top node, indicating that Pav directs classification according to the learning behavioral types.

Table 3: Correlation of psychological factors

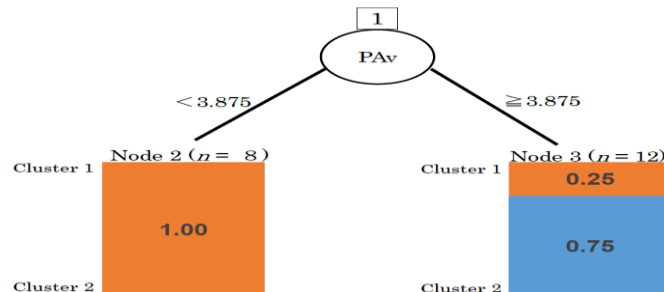| Variable	SE	IV	TA	CS	SR	PAp	PAv	TEAp	TEAv
SE	-								
IV	0.70	-							
TA	-0.06	0.38	-						
CS	0.17	0.31	0.20	-					
SR	0.29	0.52	0.38	0.63	-				
PAp	-0.15	-0.42	-0.28	-0.48	-0.37	-			
PAv	-0.05	-0.01	0.10	-0.42	-0.21	0.60	-		
TEAp	0.27	0.25	0.16	0.55	0.46	-0.62	-0.87	-	
TEAv	0.27	0.49	0.30	0.56	0.56	-0.74	-0.63	0.81	-

Figure 9: Tree-based analysis of Clusters 1 and 2

4   Discussion

Regarding the results pertaining to RQ1, the students were classified into the seven learning behavioral types. In [14], more than 60% of the students were classified as procrastinators; however, in our study, only 34.62% were so identified. One possible reason for this difference might be the small sample size in our study. Furthermore, as shown in Figure 1, a large number of students who were not classified as (a) procrastinators engaged in rushed learning in the last three weeks, suggesting a number of potential procrastinators.

Another of this study's findings is that, although there are a number of procrastinators and potential procrastinators, all students successfully completed the tasks, regardless of the learning behavioral type with which they were labeled. Hence, these students can be considered active rather than passive procrastinators. The point is that they activated their SRL to accommodate the difficult situation that presented itself in Week 9, when they had to accommodate end-of-term exams and reports; they caught up after or before Week 9 or they progressed through their studies before the deadline. In relation to RQ2, PAv can predict whether a student will become a procrastinator. PAv is a form of procrastination based on avoidance thinking, such as "I will put it off because the task is too difficult." The PAv factor has a strong aspect of passive procrastination. It would be hypothesize that when students' PAv awareness scores fall below a certain level, procrastination due to negative reasons will decrease, and they will be able to autonomously control their learning behavior at a point in time that is earlier than just before the deadline. In this study, no student was judged to be a passive procrastinator based on their actual learning behavior because all of the students eventually completed the assignment. However, some students had strong procrastination awareness; task difficulty and other factors may change their learning behavior so that they exhibit as passive rather than active procrastinators.

5   Limitations and Future Research Implications

This study has several limitations. Firstly, we need to analyze data from larger samples with a wider variety of learners. Secondly, we need to more carefully consider the difficulty level of the assignment and each student's proficiency level. The students who participated in this study generally completed the assignments, and they were judged to be active procrastinators. However, it might be coincidental that the learners' learning level matched the difficulty level of the assignment in this study. By incorporating more variety, we need to broaden the association and consider the factors that may affect students' learning behavior. Thirdly, it is necessary to analyze students' learning from a qualitative research viewpoint in order to explore the reasons or factors influencing their learning. The resultant data would provide new suggestions for future education in terms of learning strategies, instructional methods, and task design suited to each type of learning behavior. Finally, this study was conducted in a distance online learning environment. As discussed in [5], other psychological factors such as "fatigue" in the COVID-19 paradigm may be highly influential with respect to learning behaviors in general. These issues comprise the agenda for our future research.

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