Self-Regulator: Preliminary research of the effects of supporting time management on learning behaviors

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Abstract—**This preliminary research investigates the effects of self-regulated learning support using the system "Self-regulator (SR)," and relationships between self-regulated learning awareness, learning behaviors, and perceived effects of SR. The results showed that the course with SR promoted "meet the deadline" awareness. The results of Spearman's correlation analysis revealed that procrastination awareness for high performance is one of the key factors for time management, which is an important factor of self-regulated learning.**

Keywords-Self-regulated learning, Time management, learning behaviors

I. INTRODUCTION

Asynchronous learning environments such as Massive Open Online Courses (MOOCs) are becoming popular all over the world. In an e-learning context, a high performer has time management skills, which is one of the important factors of self-regulated learning (SRL). SRL has positive relationships with learning behaviors [1]. Reference [2] indicated that a negative attitude toward information and communication technology (ICT) use has a positive relationship with goal setting, time management, help-seeking, and self-regulation. Reference [3] investigated the relationship between learning performance and habit. They found that a high performer tends to learn learning materials through regular time management. Reference [4] suggested that internal value, self-regulation, and procrastination are fundamental elements that enhance the awareness of time management for planned learning. Their findings matched those of Reference [5] for face-to-face learning environments. According to the previous research, supporting time management for learning seems to be desirable for learners' SRL skill fostering. This preliminary study aims to investigate the effects of the support for SRL skills, using a SRL support system "Self-Regulator (SR)."

II. METHODS

A. System

In this preliminary research, we used a learning support system "Self-regulator (SR)," which supports making a learning schedule. Learners first log into the SR, and are required to make a learning schedule for each learning material uploaded in the learning course. The SR reads the data of the learning courses and learning materials from the learning management system "Moodle." After making a learning schedule, the SR allows the learners to access the learning course and materials on Moodle according to the learning time that learners set. Learners cannot access Moodle directly due to web server settings. Fig. 1 and Fig. 2 show the interface of the SR.

B. Participants

The participants were 27 university librarians (Male: 15, Female: 12, average working experience: 10 years, range: four months – 30 years). The librarians were asked to use the SR. The administrator set the learning course "Advertisement strategies for university library" on Moodle and uploaded nine learning materials. This course lasted three months. The librarians were required to answer questionnaires before the first day (pre-questionnaire) and at the end of the last day (post-questionnaire). After the pre-questionnaire, the administrator explained the SR usage to the librarians, and required them to make a learning schedule before learning the materials

C. Data Collection and Analysis

Two methods were used for the data collection: a questionnaire and log. The 2 x 2 Measure of Time Related

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Academic Behavior (2 x 2) [6], which consists of four factors (Procrastination – Approach (PAP) (e.g., "I delay completing tasks to increase the quality of my work"), Procrastination – Avoidance (PAV) (e.g." I delay starting tasks because they are overwhelming"), Timely-engagement – Approach (TAP) (e.g., "I do my best work well ahead of the deadline"), Timely-engagement – Avoidance (TAV) (e.g.," I begin working on a newly assigned task right away to avoid falling behind."); 22 items in sum (rated on a seven-point Likert scale), was used for the subjective evaluation of learners' SRL skill. This scale is strongly related to SRL skills [4]. The librarians were asked to complete the 2 x 2 scale both before and after the course. The differences between their responses in the pre- and post-questionnaires were analyzed. The perceived effects of the SR were also investigated using the post-questionnaire in a five-item Likert scale. The second method of data collection was a log that recorded the time that the librarians made a learning schedule and learning time in "yyyy/mm/dd/" format.
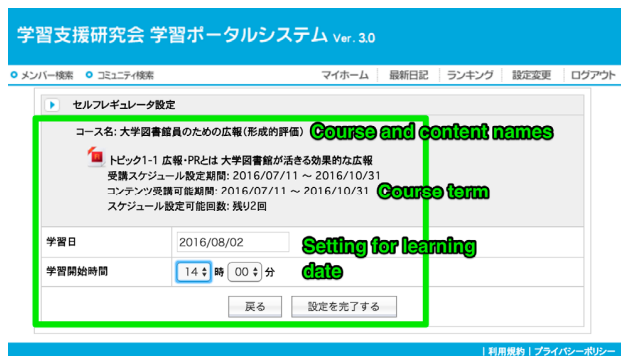

Figure 1. The SR Interface (Learning date setting)

Figure 2. SR Interface (Contents list display)

III. RESULTS

The number of librarians who did not access the SR at all was six, and the ones who accessed one or two contents were four. These librarians were categorized as the "Dropout" group. After the elimination of null data, the questionnaire dataset consisted of 17 learners' items, including dropout

librarians (the "Regular access" (accomplished over five contents) group: 12, dropout: 5). 2 x 2 data were analyzed using the non-parametric test, the Wilcoxon sign-ranked test, in order to evaluate the differences between pre- and post-class responses from the viewpoint of the improvement of SRL, comparing the "regularly-access" librarians with the "dropout" ones. Table I shows the results.

How did the librarians use the SR and perceive its effects? In order to investigate the awareness of time management (2 x 2 in the pre-questionnaire), the perceived effects, and learning behaviors, we analyzed the relationship between them, focusing on the regularly-access librarians (12 librarians). Spearman's rho (ρ) was employed in order to investigate these relationships. Table II shows the descriptive data of the learning behaviors (averages and standard deviations). Table III shows the results of Spearman's correlation analysis.

The results of the Wilcoxon sign-ranked test show that a timely-engagement – approach and avoidance were higher in the post-course responses compared to the pre-class responses (TAP $Z = 1.883$, $p < 0.1$, TAV $Z = 2.216$, $p < 0.05$). Through the course using the SR, the regularly-access librarians were aware of the accomplishment of the learning materials on time when the librarians set up a learning schedule.

TABLE I. AVERAGES AND THE RESULT OF THE WILCOXON SIGN-RANKED TEST ON THE 2 X 2, COMPARING "REGULARLY ACCESS" AND "DROPOUT"

		PAP (7 - 49)	PAV (4 - 28)	TAP (6 - 42)	TAV (5 - 35)
		Ave. (SD) Median	Ave. (SD) Median	Ave. (SD) Median	Ave. (SD) Median
Regularly-access	Pre	15.77 (7.65) 15.00	8.00 (2.83) 7.00	26.15 (4.71) 26.00	23.46 (6.29) 26.00
	Post	16.00 (7.93) 15.00	9.38 (4.70) 9.00	27.15 (8.52) 29.00	24.08 (7.51) 25.00
Dropout	Pre	20.75 (8.96) 20.50	10.75 (6.70) 11.00	26.00 (11.22) 26.50	25.00 (7.07) 22.50
	Post	21.75 (4.57) 21.00	14.75 (9.50) 15.00	19.75 (9.87) 22.00	17.25 (7.41) 18.00
Z		0.114	0.966	1.883	2.216
Sig.		n.s.	n.s.	p < 0.1	p < 0.05

Note: The number inside () is min-max

In the descriptive data of learning behaviors, almost all of the librarians did not change their learning schedule (two librarians out of twelve changed). Regarding the difference between the day that learners set the learning schedule and the learning day, seven librarians accomplished the learning material in the same day that they made a learning schedule. Interestingly, the librarians made a learning schedule for one learning content, and then a few minutes later, they accessed and started the learning material.

From the results of Spearman's correlation analysis, we found three significant and weakly significant correlations; the frequency of changing learning schedule – PAP, - perceived ease of making a learning schedule on the SR

(negative in both correlations), and the number of the learning materials that were learned – PAP (positive). The librarians who are aware of postponing their learning schedule as learning strategies with meta-cognition tended to spread the learning schedule (e.g., one learning content per day), and did not change the learning schedule. That is, the librarians who have high PAP awareness set a learning schedule and started their learning soon after, when they found the free time. A possible reason for this successful learning behavior is that the librarians seemed to be aware of learning in their daily life with high motivation. This condition may foster learning ownership.

IV. CONCLUSION AND FUTURE WORKS

This preliminary research aims to investigate the relationship between SRL awareness of time management and learning behavior using the SRL support system "SR." The results show that the course using the SR promoted timely-engagement awareness in both positive and passive senses. Spearman's correlation analysis was conducted in order to find the relationship between learning behaviors, awareness of time management, and perceived effects of the SR. The results revealed several weakly significant relationships between the frequency of changing learning schedule and PAP, - perceived ease of making a learning schedule on SR, and the number of learning materials that was learned and PAP. These results may suggest the research viewpoint; the influence of the method for making a learning schedule.

Future research should address the following three points: first, the relationship between learning performance, learning behaviors, and SRL, in particular, how to make a learning schedule; second, the need to increase the number of participants in the research and analyze the concrete relationship between learning behaviors, SRL, and learning performance with multiple regression analysis. The findings of the learning analytics research (e.g., [7]) should be useful for future research; and third, possible measures to improve the functions of the SR. There are many steps to make a learning schedule in the current version. In fact, the librarians reported that it was bothersome using the SR for their learning.

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TABLE II.   AVERAGES OF LEARNING BEHAVIORS

	Average Frequency (SD)
The frequency of changing learning schedule	0.33 (0.78)
The number of the learning materials that learned	8.42 (1.24)
Learning days	5.83 (2.33)
The difference between the day that learner set the learning schedule and learning day	1.17 (1.89)

TABLE III.   RESULTS OF SPEARMAN CORRELATION ANALYSIS

	The frequency of changing learning schedule	The number of the learning materials that learned	Learning days	The difference between the day that learner set the learning schedule and learning day
PAP	**-0.521** **0.082†**	**0.508** **0.082†**	0.174 0.589	-0.086 0.790
PAV	0.164 0.611	-0.237 0.459	-0.157 0.626	0.197 0.539
TAP	0.000 1.000	0.037 0.909	0.256 0.422	-0.146 0.652
TAV	0.065 0.840	-0.009 0.977	0.341 0.278	-0.189 0.558
SR was easy for me to make a learning schedule	**-0.602** **0.038***	0.493 0.103	0.184 0.567	0.129 0.690
I could keep a learning schedule, due to SR	-0.168 0.601	0.119 0.712	0.108 0.738	0.186 0.562
SR promotes learning habit on time, as I made a learning schedule	-0.467 0.126	0.312 0.324	0.234 0.464	0.132 0.682
SR was bothersome to use for my learning	0.399 0.199	-0.324 0.305	-0.182 0.572	0.367 0.241

Upper: Spearman's ρ, Lower: Significant difference †: $p < 0.1$, *: $p < 0.05$