Formative Assessment and Support for Students' Self-Regulated Learning in E-learning

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Introduction

Assessment is generally used to measure learning progress and to collect evidence for final grades. From a learner's perspective, assessments are seen as milestones and as key factors when creating study plans. Unlike face-to-face classroom instruction, distance education and e-learning provide flexible learning due to the lack of time and space constraints. However, at the same time, they require learners' self-regulated learning (SRL). Successful performance in higher education is related to one's self-regulation (Zimmerman & Schunk, 2008). Self-regulation refers to the degree to which students are "metacognitively, motivationally, and behaviorally active participants of their own learning process" (Zimmerman, 1989). SRL is an active learning process that involves regulating and monitoring learning cognition, motivation, and behavior and setting personal learning goals. E-learning could be an excellent setting to cultivate and develop one's self-regulation skills. It seems obvious that a strong positive relationship exists between e-learning and SRL. However, previous studies have reported inconsistent results on the relationship (e.g., Kramarski & Gutman, 2006; Lan, 1996), and some researchers have even reported negative relationships (e.g., Lynch & Dembo, 2004; McManus, 2000).

Two plausible explanations for this disagreement include the lack of a proper assessment tool and the diverse types of e-learning. These two factors are presented and discussed using case studies from several universities in Japan. In this paper, academic assessments and assignments are considered from an SRL perspective.

Formative Assessment of Self-Regulated Learning

The Motivated Strategies for Learning Questionnaire (MSLQ, Pintrich, Smith, Garcia, & McKeachie, 1991) has often been used in SRL research. Since the MSLQ was developed for use in traditional (i.e., face-to-face) educational settings, Barnard, Lan, To, Paton, and Lai (2009) noted that it was inappropriate for measuring SRL in online education. Several researchers have worked toward developing instruments to assess SRL in the context of online learning. For example, Barnard et al. developed the Online Self-regulated Learning Questionnaire (OSLQ), which consists of 24 items in six areas: goal-setting, environment construction, task strategies, time management, help-seeking, and self-evaluation. The OSLQ determines SRL learning style in the online learning context using small scales, and its internal reliability (i.e., Cronbach's alpha) in each area ranges from .87 to .96. However, the OSLQ does not contain items about motivation, which is an important factor in online learning (e.g., Graham & Wiener, 1996; Pintrich & Schunk, 2002). Therefore, the authors of the current paper developed an SRL scale for online learning (Goda et al., 2009) based on the work of Wolters, Pintrich, and Karabenic (2003).

The scale developed by Wolters et al. (2003), which contains 103 items in all, consists of three areas in each phase mentioned above: cognition, motivation, and behavior. Goda et al. (2010) eliminated items about online learning and developed a new SRL scale for e-learning with the data collected from 825 subjects. It consists of four factors (i.e., affective strategies, cognitive strategies,

help-seeking, and independence) and contains 40 items in all. Appendix A shows the 40 concrete items in four factors and the internal consistency of each.

The scale has been used as a formative assessment of SRL in e-learning to investigate the relationships between learners' types and learning behavior to determine the necessary support for each student (Yamada et al., 2011). The research has revealed that different types of e-learning may require different levels of SRL in students.

For example, Otemae University provides full e-learning courses for on-campus students, and they maintain an 80% completion rate for all e-learning courses as a result of ingenious attempts to cultivate students' SRL, especially learning habits and time management (Goda et al., 2009). Their unique attempts at comprehensively supporting learners' learning habits are multidimensional. These supports could be useful in helping students form their learning habits, requiring less SRL compared with other fully online courses. When the completion rate was analyzed based on the four factors of the SRL scale (Goda et al., 2010), it was revealed that students with middle and high levels of "affective strategies" and "cognitive strategies" completed class assignments and assessments regularly, and their completion rates were above 90%. On the other hand, those with low levels for all four SRL factors or high levels for all factors completed fewer assignments, and their completion rates were 78.89% and 53.33%, respectively.

The case of Yamagata University provides another example of the SRL scale application. Blended learning courses (with face-to-face instruction and e-learning) were used to examine the effects of e-mentor presence on SRL factors. The research indicated that perceptions of the e-mentor's presence slightly affected help-seeking.

The observations noted above reveal that SRL in e-learning might be affected by various factors related to design, implementation, learning environment, learning content, available learning support, and so on. Some types of e-learning require higher levels of SRL, while others (i.e., those that provide comprehensive learning support and that have been developed considering learning mechanisms) require lower levels. From the various types of e-learning and the associated information, the processes and products of learning, including course-completion rates, might be able to be predicted with a certain degree of confidence. Aoyama Gakuin University has been providing an e-learning professional cultivating program since 2006. They deliver two different types of courses for the project: full online courses without credits and blended learning courses with credits. The accumulated data shows that the completion rate for the former type is approximately 20%, while that of the latter type is roughly 75%. This complexity in terms of context and subject diversity might contribute to the inconsistency in the research on the SRL–e-learning relationship. Of course, it is essential that a valid and reliable instrument be used to measure SRL in e-learning. However, in order to understand the relationship between SRL and e-learning, the factors that potentially affect SRL should be considered.

In the next section, the manner in which evaluation plans affect students' SRL and learning is illustrated using the cases of Otemae University and Kumamoto University. Learning habits and time management are also a focus in this section of the paper.

Self-Regulated Learning and Time Management

To enhance SRL skills, metacognition should be utilized properly (Pintrich et al., 1993). Metacognition refers to the ability to control one's cognitive processes as "metacomponents," which are responsible for "figuring out how to do a particular task or set of tasks, and then making sure that the task or set of tasks are done correctly" (Sternberg, 1986).

Self-monitoring and control are fundamental categories of metacognition and consciousness (Kihlstrom, 1984). Self-monitoring and control can be causally efficacious for learning (Nelson et al., 1996). The academic learning cycle includes forethought, performance or volitional control, and

self-reflection (Shunk & Zimmerman, 1998). In order to cultivate one's self-regulation for learning, accurate metacognition must be acquired and cognitive and affective skills must be adopted gradually during the repetition of the learning cycle.

One of the problems instructors, administrators, and tutors or mentors engaging in e-learning face is that learners do not study regularly (i.e., they do not access a learning management system (LMS) regularly). Without time and place constraints in the e-learning setting, learners have to initiate, manage, and control their own learning. The effective management of time (along with an appropriate study environment and cultivated SRL skills) leads to the successful accomplishment of learning goals (Pintrich et al., 1993). Organizational and time-management strategies are strong predictors of academic achievement (Nonis et al., 2006).

The ability to appropriately allocate cognitive resources, such as deciding how and when a given task should be accomplished, is also essential to intelligence (Sternberg, 1986). College administrators and instructors should focus on developing interventions to instill a healthy sense of self-efficacy in students and teach them how to manage their time effectively, especially for first-year students (Kitsantas, Winsler, & Iiuie, 2008). Developing the time-management skill is one SRL strategy (Zimmerman, Bonner, & Kovach, 1996), and practicable methods of acquiring time-management skills include (1) creating regular learning habits, (2) setting practical and feasible goals, (3) using the same place for learning, and so on (Zimmerman et al.). In the next (Case Studies) section, the time-management aspect of SRL is considered and discussed.

Case Studies

E-Learning at Otemae University
At Otemae University, the e-learning program has been well designed and carefully implemented from the perspectives of (1) course design and development, (2) course implementation and mentoring, (3) customization of an LMS, and (4) collaborations among instructors and e-learning professionals.

(1) Course Design and Development
All courses provided at Otemae University were designed and developed under the supervision of instructional designers. Working closely with course instructors, the instructional designers set learning goals, evaluation methods, learning activities, and SRL materials. During the design phase of the instructional design cycle, the roles of instructors, mentors, and tutors were discussed, and facilitation and support during course implementation were also considered. Not only were course goals set, but also the learning outcomes of all 15 weeks were decided at the beginning of the course design, and each week involved several assignments (e.g., quizzes, discussions, and/or short reports). It was believed that the frequent tests/assignments would assist students in developing effective learning habits. This is supported by Boylan, who pointed out (at his keynote speech at the 5th *Japan Association of Developmental Education Conference* in 2009) that frequent tests are useful in developmental education. Regarding SRL materials, the instructional designers consulted with content specialists from the media section to conduct operational checks with an LMS. Considering learner behavior in the e-learning context, the materials created were less than 20 minutes long. In order to keep learners' concentration and attention, the materials included a lot of interactive work and different stimuli and media types (e.g., comics, animations, etc.).

(2) Course Implementation and Mentoring
A semester includes 15 weeks of lessons. In order to develop time-management skills, we set a two-week period for each lesson as an indication of learning one lesson. After each two-week period, students could still learn the materials on the LMS, but if they did not complete the learning materials in that time, they were treated as tardy for the lesson. Flexibility in terms of time often causes learners to postpone learning, which is one of problems with self-regulated e-learning. To solve this problem, the two-week period was employed. It was hoped that this short time period would force the students

to experience the following SRL cycle: plan, monitor, and self-evaluate learning. Moreover, this way, students had 15 opportunities to practice their time-management skills for SRL.

During implementation, the mentors monitored the students' learning progress during the weekdays and sent messages to individuals who had not made learning progress for a few weeks via the LMS and/or email. They also performed regular mentoring activities based on the mentoring guidelines created before the beginning of the semester. The mentors worked at the Learner Support Center regularly, so when students could not solve the problems using the system, they could stop by the center and ask the mentors for help. Some students did not check their email or the LMS regularly, and in such cases, the mentors created posters with important messages and posted them on the bulletin boards at the school. The mentors also shared course-mentoring guidelines among themselves and decided on support methods beyond the courses. It was thought that delivering similar messages in a short period might decrease students' motivation; thus, to avoid such a situation, the mentors shared the information and activities within the assigned courses. Prior to e-learning course registration, we also set a trial week (similar to that for regular face-to-face instruction courses) to decrease inevitable dropouts caused by the belief that e-learning is easy or by general curiosity about e-learning, as pointed out by Horton (2001).

(3)　Customization of the LMS
Regarding time-management, the top page of the LMS was customized to show a list of all registered courses and progress indicators for each course. All learning activities were related to the indicators. Students had to complete all activities (e.g., watching self-regulated content, taking a quiz, joining a discussion, etc.) to get a double circle during the two-week period. Students could check their progress and attendance for the 15 lessons simultaneously when they started their studies.

(4)　Collaborations among Instructors and E-learning Professionals
Collaborations among e-learning professionals are necessary for quality e-learning courses (Tamaki, 2006). The staff members at the E-learning Center possessed professional skills and experiences in the field of e-learning, and they worked collaboratively to develop and implement the courses in line with Tamaki's collaboration model. Sharing information and offering collaborative support to learners are crucial to promoting student learning and motivating learners. To continuously improve the courses, a reflection meeting at the end of each semester, at the evaluation phase of the instructional design cycle, is held, and all professionals and members who are in charge of e-learning implementation at the school join and exchange information and opinions. The hope is that sustainable efforts among professionals will increase learners' motivation and retention rates.

Learning Habits
Students' daily LMS access (from April 16 to August 7) is shown in Figure 1. In the beginning, students might have had some difficulties accessing the LMS to learn. Gradually, they seemed to develop their learning habits, and the access rates increased. The new lessons opened every Thursday, and the two-week lesson period lasted until the Wednesday two weeks later. Thus, students accessed the system most often on Wednesdays to complete their learning materials in time. The two-week lesson period forced the students to study the targeted lesson regularly.

Once the learning habits had been formed, regardless of holidays or school closures, they were maintained. However, the university was closed from May 18 to May 22 due to the H1N1 flu that was circulating. At the end of the semester, the access rate decreased for a spell and then increased right before the courses ended.
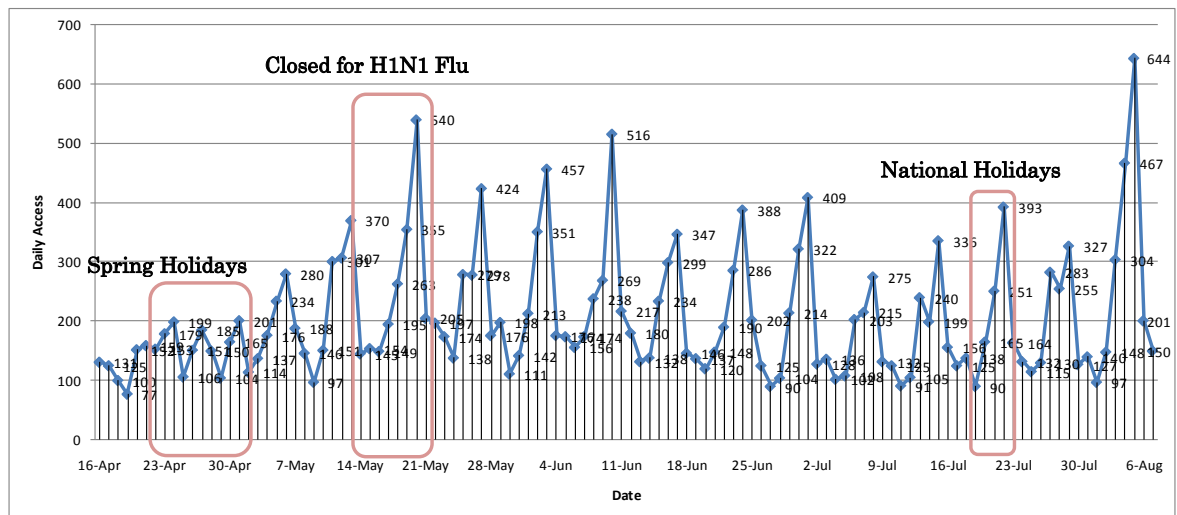
Figure 1. Daily LMS Access - Spring 2009

CALL at Kumamoto University

One of the advantages of employing Computer-Assisted Language Learning (CALL) is that it allows students to learn at their own pace if online connections are available. Kumamoto University started CALL for first-year English courses in 2002, and all freshmen are now taking a CALL English course in either the spring or the fall semester. The CALL program was designed to foster students' autonomy and SRL by integrating several online systems: the CALL application, LMS, and learning support system. Possible strategies for developing and enhancing SRL skills were discussed during weekly reflection and forethought activities in the conference presentation.

As Angelo and Cross point out, learners should "learn how to assess their own learning. If they are to become self-directed, lifelong learners, they also need instruction and practice in self-assessment" (1993, p. 9). Weekly reflection and forethought activities with the learning support system were employed in CALL courses. The reflection and forethought activity refers to learners' recorded self-evaluations on the LMS: setting a goal for a week, judging if learning progressed as planned, and determining reasons for failure (if any). This research aimed to investigate the effects of individual reflection with the learning support system on students' SRL by focusing on learning habits.

The sample included 132 students from three CALL courses. To minimize the effect of subject characteristic differences, two classes were set as control groups and one was set as a treatment group. There were 39 students in Control Group 1 (CG1), 44 in Control Group 2 (CG2), and 49 in the Treatment Group (TG). To encourage students to reflect on their own study, the integrated learning support system developed by the CALL working group at Kumamoto University was employed. The system allowed students to check their learning progress visually (i.e., with Progress Viewer, Learning Log Chart, and Accumulated Learning Hour Chart) and compare their progress with that of their classmates. This system is available on the web, so students could check their progress at any time.

Students in the control groups were engaged in classroom reflection activities with the learning support system, and students in the treatment group recorded individual reflections. Both activities were done at the beginning (first three minutes) and the end (last three minutes) of each class. In the control groups, students accessed the learning system individually, and the instructor showed the charts above on the   projector and asked students to monitor their own learning. Then, the instructor pointed out several students and asked if they studied as planned for the previous week. In the treatment group, instead of pointing out particular students, the instructor asked students to record their reflection on the LMS in the form of a letter to themselves.

Both reflection activities in the control and treatment groups intended to help students experience

self-evaluation for the previous week and forethought for the following week. The activities started in Week 4 and lasted until the end of the semester.

Self-Regulated Learning (SRL) Minutes

At the beginning of the reflection activities (i.e., in the fourth week), the differences among the three groups were not large. As Figure 2 shows, the mean of weekly SRL minutes for the treatment group with individual reflection activities increased rapidly at approximately Weeks 9 and 10. The control groups did not change in terms of the mean of weekly SRL minutes until Week 11. In Weeks 10 and 11, students in the treatment group averaged 250 to 300 minutes in SRL outside of the classroom. On the other hand, both control groups filled less than 50 minutes until Week 11. At the end of the semester, all groups increased self-learning minutes due to preparing for the final exams and assignment submissions.
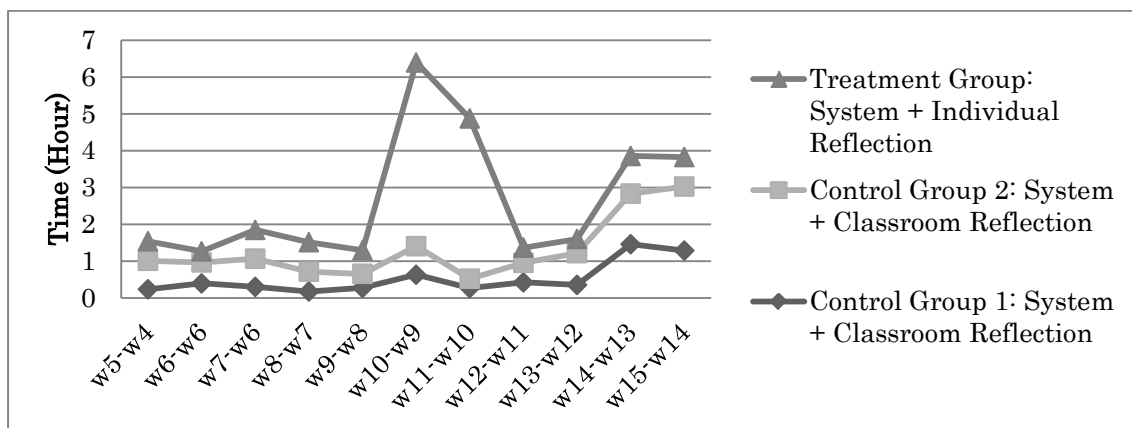

Figure 2. Self-Learning Hours of the Three Groups

Future Implications

In this paper, an overview of the relationship between e-learning and SRL was provided. Evaluation and e-learning support affect the manner in which students learn and manage resources. Types of e-learning may change students' cognitive, affective, help-seeking, and self-independence strategies in terms of SRL. When assessments and assignments are designed for e-learning, actors (including designers, instructors, and mentors) should realize that they are also designing students' learning. Different learning activities along with assessments could be planned to support learners' ability to cultivate and develop their SRL. Moreover, while assessments and evaluations need to be developed as valid and reliable instruments, they might make learning more student oriented and provide good opportunities for students to control and regulate their learning. Further research on the relationship between e-learning and SRL should be investigated in order to improve practical support for life-long learning.

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APPENDIX A

Factor	Cronbach's alpha	Question Item
1.Affective Strategies	0.904	I remind myself how important it is to do well on the tests and assignments in this course.
		I tell myself that I need to keep studying to do well in this course.
		I persuade myself to keep at it just to see how much I can learn.
		I tell myself that I should keep working just to learn as much as I can
		I remind myself about how important it is to get good grades.
		I tell myself that I should work at least as hard as other students.
		I think about how my grade will be affected if I don't do my reading or studying.
		I keep telling myself that I want to do better than others in my class.
		I try to study at a time when I can be more focused.
		I convince myself to work hard just for the sake of learning.
		I make good use of my study time for this course.
		I think about trying to become good at what we are learning or doing.
		I usually study in a place where I can concentrate on my course work.
		Even when course materials are dull and uninteresting, I manage to keep working until I finish.
		I promise myself I can do something I want later if I finish the assigned work now.
		I change my surroundings so that it is easy to concentrate on the work.
2.Cognitive Strategies	0.852	When studying for this class, I read my class notes and the course readings over and over again.
		When I study for this class, I pull together information from different sources, such as lectures, readings, and, discussions.
		When I study for this course, I go through the readings and my class notes and try to find the most important ideas.
		When I study for this course, I go over my class notes and make an outline of important concepts.
		I memorize key words to remind me of important concepts in this class.
		When I study for this class, I practice saying the material to myself over and over.
		When reading for this class, I try to relate the material to what I already know.
		When I study for the readings for this course, I outline the material to help me organize my thoughts.
		I try to understand the material in this class by making connections between the readings and the concepts from the lectures.
		I make simple charts, diagrams, or tables to help me organize course material.
		I try to relate ideas in this subject to those in other course whenever possible.
3.Help Seeking	0.833	Getting help in this class would make me a better student.
		Getting help in this class would make me a smarter student.
		If I needed help understanding the lectures in this class I would ask for help.
		If I needed help with the readings in this class I would ask for help.
		If I needed help in this class I would ask someone for assistance.
		If I were to get help in this class it would be to better understand the general ideas or principles.
		I would get help in this class to learn to solve problems and find answers by myself.
		Getting help in this class would be a way for me to learn more about basic principles that I could use to solve problems or understand the material.
		Getting help in this class would increase my ability to learn the material
4.Self-Independency	0.781	Others would think I was dumb if I asked for help in this class.
		I would not want anyone to find out that I needed help in this class.
		Getting help in this class would be an admission that I am just not smart enough to do the work on my own.
		I ask myself questions to make sure I understand the material I have been studying in this class.