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Impact of Self-analysis Behaviors in GOAL for Japanese High School EFL Learners

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Abstract: I In the 21st century, self-directed learning (SDL) has become an essential skill for personal growth and success. This applies to the context of language learning as well. To enhance students' SDL skills, we previously proposed the DAPER (Data, Analyze, Plan, Execution, Monitoring, Reflect) model and developed the GOAL (Goal-oriented Active Learner) system to support DAPER. In this study, we focused on the Analysis phase of GOAL. 113 students tracked their scores in 39 weekly tests (19 for English vocabulary and 20 for English grammar) over one year in GOAL. Their self-analysis behaviors after studying and taking tests were also prompted in GOAL. We investigated the relationship between analysis behavior and test scores, finding a significant difference in learning outcomes between students who conducted self-analysis and those who did not. While the current result cannot definitively conclude that self-analysis improves study performance in language learning, it does show that it is meaningful to promote students' SDL behavior tends to perform better.

Keywords: English as Foreign Language (EFL), Self-analysis, DAPER, GOAL, Self-directed learning

1. Introduction and Motivation

Self-directed Learning (SDL) is an essential skill in the 21st century (P21-Framework, 2009). Significant advances have been made in the methods we acquire knowledge, and there is an explosion in the volume of resources. In this context, promoting SDL skills with technology support has become crucial (Teo, 2010). Analysis skills, an essential part of SDL, can help learners understand their learning progress better, including study habits, progress, outcomes, and evaluating the efficacy of their study strategies (Noguchi & McCarthy, 2010).

Many programs focusing on developing students' SDL habits often discuss teaching methods and strategies, overlooking other vital factors in SDL like personal needs, self-planning, and self-evaluation (Mia Victori, Walter Lockhart, 1995). While as a component of SDL, self-assessment has been shown to help students improve their speaking skills in English (Chen, 2008), self-analysis exploring personal behavior patterns of achievement has not been studied for its effects on language learning. To fill this gap, we analyzed the impact of self-analysis on the outcomes of English vocabulary and grammar learning, investigating the following research question: What is the relationship between students' self-analysis habits and their performance in English vocabulary and grammar learning?

2. Goal system for supporting weekly language tests and preparation

The Goal Oriented Active Learner (GOAL) system (Majumdar et al. 2018), is a student-oriented digital platform that focuses on enhancing students' Self-directed Skills (SDS). Using the GOAL system, students can track their activities, analyze activity data, set goals,

execute monitoring, and reflect on a wide range of activities related to their studies and health, encouraging them to take ownership of their learning processes. The GOAL system can record and visualize students' past activity data, allowing them to confirm their progress and easily grasp their situation.

2.1 *Self-analysis in goal*

As an essential step in DAPER, users can conduct simple analysis tasks on the collected data related to an activity. Through this, users can understand their behavior and identify individual problems. The GOAL system offers data input form (for weekly test scores) or synchronizes data from online platforms (for eBooks reading activity) for the data collection phase. For the analysis phase, data is visualized to support users to analyze more clearly and simply. Broadly, the system compares current data with past data or with group averages.

In language learning, the GOAL system offers three parameters (average time, total time, and digitalized learning outcomes) to evaluate the test time score and study time. Scores are evaluated by comparing current test results with past results, and class averages. Students can confirm these data, input comments, and express expectations for performance in the next test.

2.2 *GOAL interface*

In the language learning part of the GOAL system, students can confirm their SDL skill levels and information related to their scores and preparation time in past tests, as shown in Figure 1.

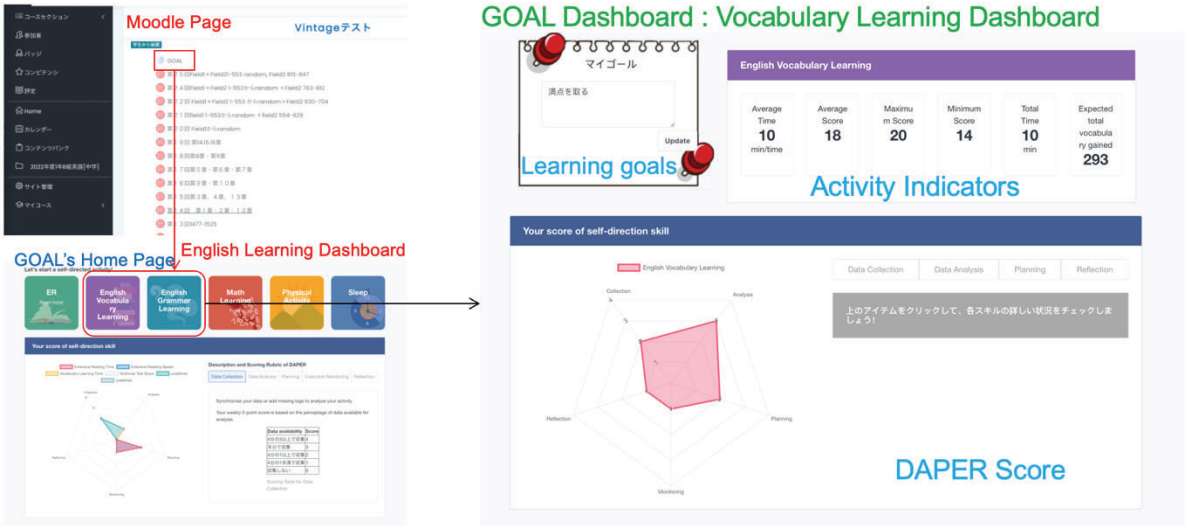

Figure 1. The students' workflow in the GOAL system for test score registration

The students can input their weekly test scores and the time they spent preparing for a particular test. Then they can check the average test score of their class and get feedback from the system. They can analyze the score and time with the system prompts as shown in Figure 2.

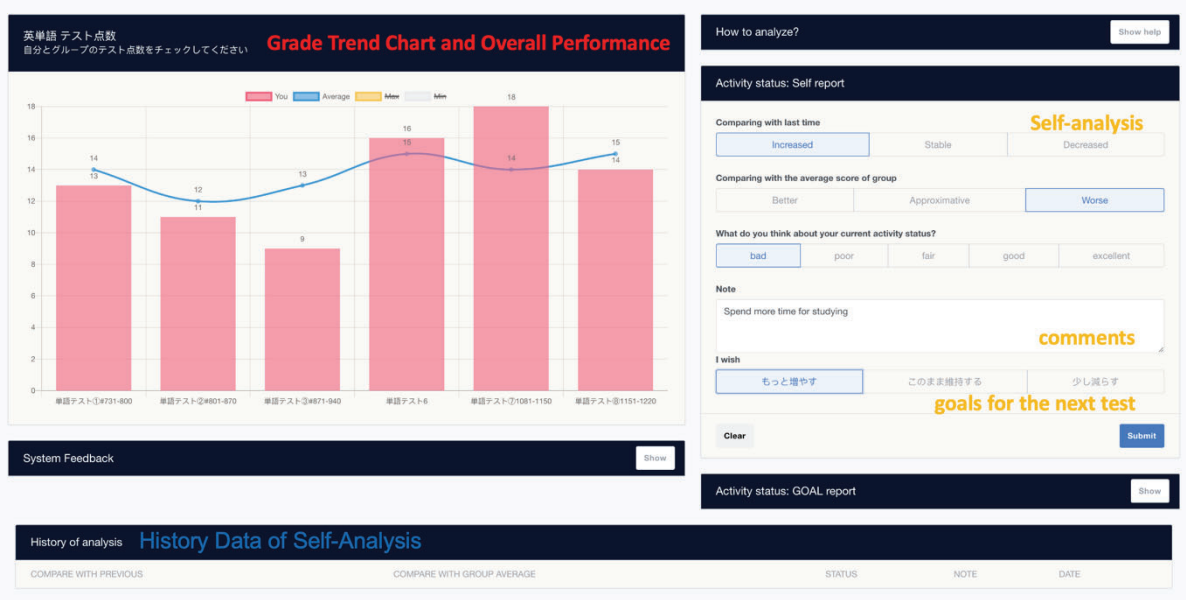

Figure 2. The vocabulary test score analysis interface (Yang et al. 2023)

2.3 *GOAL learner model*

In this study, the goal learner model records all student data from each vocabulary and grammar test, including the student's UUID (Universally Unique Identifier), a serial number automatically assigned within the system, preparation time for the test, test scores, feedback on test difficulty, analysis of test scores, and hopes for the next test. However, this data is only recorded if the student completed these activities. These activities are not mandatory; when a student is absent for a test, their score is recorded as null.

3. Research context and findings

3.1 *Study context and analysis method*

This research was conducted in a Japanese high school. Students were given English vocabulary and grammar learning tasks independent of the regular classroom curriculum. The material for learning English vocabulary was a word book called LEAP (Takeoka, 2018), and the material for learning grammar was called Vintage (Shinoda & Yoneyama, 2018). Vocabulary and grammar tests were conducted every week. Each vocabulary and grammar test consisted of approximately 50 questions, and the total score was 20 points. Students needed to study independently to achieve better results in university entrance examinations. Teachers introduced the GOAL system and its usage at the beginning of the term. However, the use of GOAL was not compulsory but just advised to keep track and analyze students' scores and efforts concerning time spent preparing for the test.

We collected data from 2021 for weekly English tests for 113 second-year high school students in Japan. These tests included 19 vocabulary tests and 20 grammar tests. Each test had its scope determined beforehand, allowing students to prepare for the test in advance. After eliminating invalid data (such as duplicate inputs and test data from the administrator), we obtained a total of 3129 English test score entries from high school students and 751 logs related to students' analysis of their exam scores. Of course, some students may have studied for tests but didn't record and manage their study time data using GOAL.

Table 1, Distribution of the collected data and learners in GOAL system

	logs (learners)	self-analysis logs (learners)
vocabulary test score	1552 (113)	186 (31)
grammar test score	1577 (113)	204 (25)

From Table 1, compared to the collected activity data, much fewer data were analyzed for these activities by the students themselves. We observed that only a small proportion of students analyzed the data after preparing for the test and taking the test. Figure 3 is a frequency distribution chart where the vertical axis represents the number of people who took the activity that many times in four activities, and the horizontal axis represents the number of times an activity was taken in four activities.

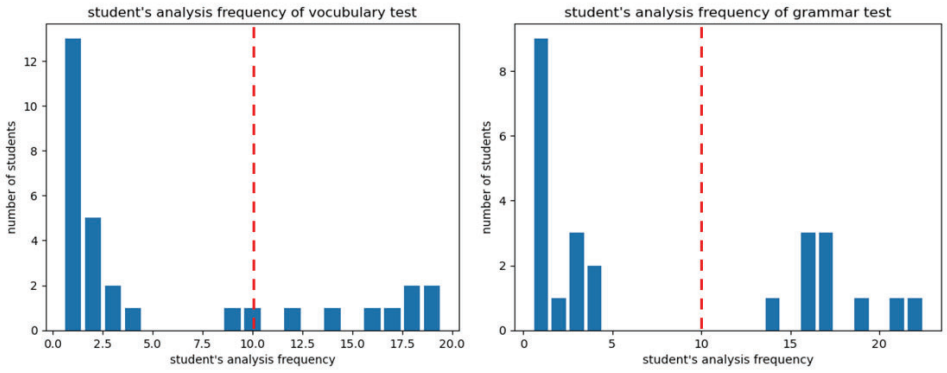

Figure 3 The frequency of students' analysis activities for test score

Based on Figure 3.1, we divided into 2 groups: students who have analyzed their scores after both the vocabulary and grammar tests more than 10 times, and another being students who have done less than 10 times. If a student has analyzed their scores more than 10 times in the grammar tests out of a total of 20 tests and more than 10 times in the vocabulary tests out of a total of 19 tests, we can say they have developed a habit of self-analysis. To analyze whether a student who has developed a habit of self-analysis will influence their study performance in language learning or not, we calculated the average of the scores of Group A, which has analyzed more than 10 times, and Group B, which with fewer than 10 times on the vocabulary and grammar tests every time and conducted a t-test.

3.2 *The difference in the performance of students based on self-analysis behavior.*

The difference in test scores of students with and without self-analysis of test scores after the same tests are as follows.

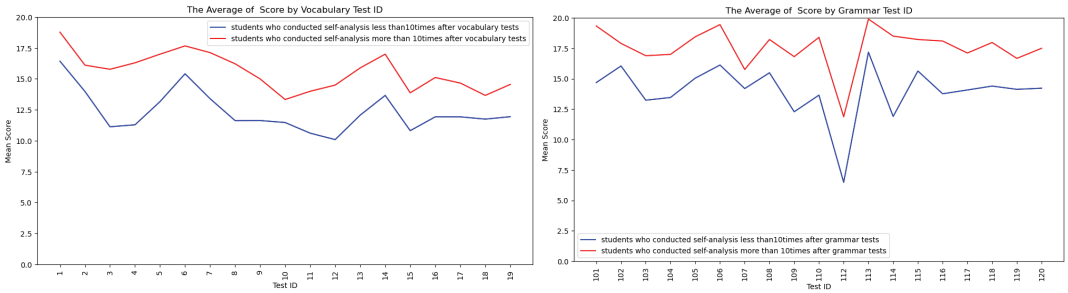

Figure 4. The difference in test scores of students with and without the self-analysis

reporting

Table 3. The information of scores of the students with and without the habit of analysis

	With self-analysis habit (N= 9)	*Without self-analysis habit (N= 104)*	*Statistics*	*p-value*
Vocabulary Score	*15.6 (1.92)*	*12.5 (3.29)*	2.76	0.003*
Grammar Score	*17.6 (1.18)*	*14.5 (6.97)*	1.38	0.086

4. Discussion and Conclusion

In this study, we analyzed the impact of self-analysis on the outcomes of English vocabulary and grammar learning and found a significant impact in English vocabulary learning through the results. The performance of students with self-analysis habits is higher than those without self-analysis in vocabulary learning. So we can say that having a habit of self-analysis will help students learn English vocabulary better. On the other hand, even if the average of students with self-analysis habits on grammar tests is higher than those without, by the result of the t-test, it cannot be definitively said that there is a difference. And We think that the lack of significant impact on grammar learning might be due to the fact that grammar learning is possibly a more complex process involving the understanding of rules and structures. Vocabulary and grammar may involve different cognitive and learning processes. Self-analysis might be more suitable for vocabulary learning, which requires memory and recall, rather than rule-based learning in grammar. It could also be possible that the methods used to assess grammar skills are not sensitive enough to detect the impact of self-analysis. These reasons have given us direction and insights for future research.

The findings of this study align with the proposal of the DAPER model, emphasizing the importance of self-analysis in the learning process. By analyzing their own data, students can set specific goals, plan their learning strategies, execute them, monitor their progress, and reflect on their outcomes. The GOAL system supports this process by providing a platform for students to record and reflect on their self-directed learning activities. The significant impact observed in vocabulary learning through self-analysis demonstrates the effectiveness of this approach, while the inconclusive results in grammar learning highlight areas for further investigation.

After demonstrating that self-analysis aids students in learning vocabulary and has some impact on learning grammar, we focus on developing the habit of self-analysis in students. Then, we discovered an interesting phenomenon. If we consider that students analyzed more than 10 times have a habit of self-analysis, then those analyzed from 1 to 10 times in each analysis activity are students who are trying to cultivate their habits of self-analysis. We had a hypothesis that these students should have three stages in their self-analysis: not conducting analysis, attempting analysis, and frequently conducting analysis, and then transforming to the next stage as time changes. However, the analysis data from the activities of students shows that they tend to conduct analysis activities during a specific period. This includes both the study time and test scores for vocabulary and grammar tests. But they can't stick with it. The special period here does not refer to a fixed time. each student has a special period, but it's also possible that they don't. After maintaining a certain period of self-analysis activities, they will stop the analysis activity.

The practical implications of this study offer insights into self-analysis that can enhance vocabulary acquisition, encouraging students to actively engage in the process. Simultaneously, the application of the GOAL system reinforces this process, fostering the development of students' self-directed learning and self-analysis skills. The findings also highlight the need for further research to understand why students may struggle to maintain self-analysis habits, leading to potential interventions to support sustained engagement.

For future work, we aim to analyze why self-analysis shows a higher impact on helping students in vocabulary learning than grammar learning. We also want to verify further self-analysis's impact on language learning outcomes and others' learning outcomes. At the same time, we have also collected data on the amount of time students spent preparing for exams, as well as their analysis and reflections on their preparation time. We hope to analyze whether there is a relationship between this and their study performance. Additionally, we want to analyze the reasons why students cannot stick with analysis activities, and based on the reasons, propose methods to encourage students to develop in self-analysis, we aim to provide more suitable support to promote students' development of self-analysis and SDL skills.

Acknowledgements

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