Development of a Mobile Application for Listening and Scaffolded Autonomous Summary Speaking and Its Effectiveness for Increasing Fluency

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Abstract Although summarizing English texts is an effective method for improving English speaking skills, it is difficult for learners to use this approach through self-study without teachers’ support. In this study, we developed the Mobile Application for Listening and Scaffolded autonomous summary speaking (MALS) and evaluated its effectiveness for increasing oral fluency. MALS offers not only a summary speaking task but also scaffolding practice that decrease the cognitive load of summarizing by facilitating learners in confirming the summary points and the recommended words. The results showed that (1) the scaffolding enables learners to do a summarizing task in their self-study, and (2) MALS is effective for not only increasing the number of non-repeated words and decreasing silent time but also decreasing frequency of repair. Hence, MALS compares favorably with reading aloud activities that are judged effective for only increasing the number of non-repeated words and decreasing silent time.

Keywords: supporting system for language learning, English speaking, fluency, summarizing

1. Introduction

In recent years, due to globalization, the need for people to acquire English skills has become indisputable in countries where English is not a native language. Regarding Japan, it is necessary for not only people who work internationally but also for those who live and work only in Japan to improve their English skills because the number of foreign people visiting the country has been increasing. In addition, the Olympic Games will be held in Tokyo in 2020, which means Japanese people in general will want or need to increase their English abilities.

However, the skills of Japanese learners of English as a foreign language (EFL) are still at a low level. For example, the total average score for Japanese takers of the Teaching of English as a Foreign Language Internet-based Test (TOEFL iBT) in 2015 for all four skills was the third lowest out of about thirty Asian countries, and speaking and listening scores were lower than those for reading and writing.

One of the reasons for weak speaking skills is that Japanese have few opportunities to practice speaking English. For example, a survey done by Benesse, which is one of the most famous educational research institutes in Japan, showed that about 80% of Japanese junior high school and high school students do not practice speaking English at home by self-study (e.g., giving a presentation, expressing one’s own opinion in English, etc.), even though they take an English class several days a week. This survey suggests that many Japanese undergraduate and graduate students also have the same problem because the situation was similar when they were high school students. Therefore, they might not have often practiced English-speaking through self-study. In other words, they need more help in practicing it on their own.

In order to solve this problem, we focused on improving fluency in speaking and we developed the Mobile Application for Listening and Scaffolded autonomous summary speaking (MALS), as a speaking practice system for self-study. This application targets Japanese undergraduate and graduate students and it offers learners not only a summary speaking task but also a scaffolding practice for decreasing cognitive load of summarizing so that they can conduct summarizing on their own. We hypothesized that MALS would promote learners’ grammatical encoding so that learners might improve their fluency.

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2. The Summarizing Task in Output Tasks

2.1 The Role of Output

“Output” is one of the tasks that help learners develop second language skills. Many researchers have shown the functions of output for second language learning\(^{(4-6)}\), which are as follows. First, when learners attempt output, they may notice a gap between what they want to express and what they can express. As a result, learners are encouraged to explore or pay attention to relevant input to close this gap. Second, they may struggle to express their intention. This process facilitates learners in expanding their interlanguage. Moreover, if a learner has a partner in the learning, both learners can determine whether or not the partner can understand what the learner said so that the learner can at the same time modify her or his output based on feedback from the partner. Third, during output, learners concentrate on not only meaning but also language form. In other words, output promotes learners’ syntactic processing. Fourth, learners become able to increase the automaticity of processing by repeating output. This results in improved fluency.

In sum, output tasks promote the development of learners’ second language skills such as syntactic processing. This suggests that it is important to motivate learners to output the target language in order to increase their speaking skills.

2.2 Summarizing Task

One of the output tasks for language learning is the summarizing task. Muranoi proposed “focus[ing] on form through guided summarizing” (FFGS) as a task in classrooms\(^{(7)}\) and “Autonomous Summarizing” as self-study\(^{(8)}\). In these methods, learners read or listen to an English text, and then tell or write a summary of it. The point of these methods is that learners write down some words included in the text or a concept map of the words in advance and utilize them when they produce the summary. In FFGS, a teacher facilitates learners in using specific words from the text and drawing a concept map of words to support the summary output, while in Autonomous Summarizing, learners choose the words and draw a concept map of the words independently. By relying on the words or their concept map when outputting a summary, learners can thereby focus on linguistic form.

Muranoi\(^{(7, 8)}\) indicated the effectiveness of these methods using Levelt’s speech production model\(^{(9)}\), which shows how people process information when speaking. The model consists of the following main components: the Conceptualizer, the Lexicon, the Formulator, and the Articulator, as seen in Figure 1. The process of speaking is as follows. First, the Conceptualizer generates a preverbal message that is what the speaker is attempting to say (Figure 1(a)). Second, the Formulator accesses the Lexicon and retrieves the necessary words (Figure 1(b)). Third, the Formulator processes grammatical encoding (Figure 1(c)). Fourth, the Formulator encodes the structure into a phonetic plan. Finally, the Articulator emits audible sounds.

Following the model, Muranoi\(^{(7, 8)}\) mentioned an advantage of the summarizing methods, which could motivate learners to concentrate on grammatical encoding (Figure 1(c)) by supporting conceptualization (Figure 1(a)) and retrieval of words (Figure 1(b)). While learners read or listen to a text and think about the summary, the activities facilitate them in generating preverbal message in Conceptualizer (Figure 1(a)). Moreover, by writing down necessary words or their concept map as preparation for outputting its summary, learners can retrieve the
words from the Lexicon easily when producing the summary (Figure 1(b)). In other words, the activities that take place before the act of summarizing provide preverbal messages and lexical items for output. Therefore, learners can pay more attention to the process in Formulator, especially grammatical encoding when they produce a summary (Figure 1(c)), which has an effect on automaticity in output and on improving fluency. In fact, learners can improve their speaking skills, including fluency, after employing FFSS or Autonomous Summarizing\(^7, 8, 10\). Hence, we could find that the crucial steps in summarizing are (1) conceptualization (Figure 1(a)), (2) retrieval of necessary words (Figure 1(b)), and (3) grammatical encoding (Figure 1(c)).

However, in order for novice and intermediate learners to utilize this method as self-study effectively, they may need additional help. It is difficult for the learners to select the main ideas from the original text in second language learning\(^11, 12\). As a result, they cannot maintain their self-study in the summarizing method. In fact, a study showed that learners conducted “Autonomous Summarizing” only once a month on average\(^7\).

Therefore, in order to facilitate learners in using the summarizing method through self-study effectively, we have to offer scaffolding to learners and then help them to understand summary points of an original English text for conceptualization and to retrieve necessary words. In this research, we designed a scaffolding practice that promotes learners’ better understanding of the text and offered it to learners before the summary task, aiming to decrease cognitive load and to enable them to summarize the text on their own.

In addition, more research is needed in order to show that “facilitating focus on grammatical encoding is effective for improving fluency.” Previous studies showed its effectiveness for improving fluency, but they did not prove that the effectiveness resulted from a focus on grammatical encoding nor did they discuss the effectiveness in detail. We must therefore compare the effectiveness of the task with a task that does not promote grammatical encoding.

### 3. Learning Systems for Practicing Speaking Skills

Many researchers have developed language-learning systems that aid EFL learners in improving their speaking skills. For example, HELLO, which was developed by Liu and Chu\(^13\), presented learners with English activities outside the classroom, such as conversation role playing with a virtual learning tutor, a story relay race, and so on. In the system of Morton et al.\(^14\), learners could conduct a realistic interactive conversation with a virtual agent using certain scenarios. Hwang et al.\(^15\) created a game-based learning environment in which learners could tell information or news based on photos or pictures they collected. These systems offered repetition tasks like reading aloud and tasks that promoted their own output.

However, these studies neither offered a variety of learning materials nor demonstrated the effectiveness of the speaking activities in detail. Learners could speak based on only limited texts because of the learning design of these systems. The present summarizing task, in contrast, is applied to a greater variety of texts so that learners can practice expression in more sophisticated contexts.

### 4. Objective of This Research

Following the discussion in the previous chapters, the aims of our research are (1) developing a learning application for the summary speaking task through self-study with the scaffolding practice to decrease cognitive load of summarizing, and (2) investigating the effectiveness of grammatical encoding for fluency in detail.

In order to achieve these aims, we developed MALS and conducted an experiment to observe the effectiveness of this system for oral fluency. First, we developed an Android application that offers not only a summary speaking task through self-study but also a scaffolding practice that facilitates learners in confirming summary points and the recommended words for summarizing. Second, we conducted an experiment in which participants were asked to use the application for six consecutive days, then we measured the participants’ speaking fluency scores, and evaluated effectiveness of MALS by analyzing the scores. In addition, we also created another system that did not support the learners’ syntactic process, and we asked participants to use one of the systems and then analyzed their pre-, post-, and delayed-test scores.

### 5. Design of the System and Learning

In our system, learners verbally present a summary of an English text through self-study. MALS offers vari-
ous kinds of scaffolding so that learners can confirm the summary points of the English text and what kinds of words in the text they can use in summary speaking. As a result, learners can conduct the summarizing task on their own and concentrate on grammatical encoding more effectively.

5.1 Learning Process in MALS

Figure 2 shows the learning process in MALS. Learners can use this system on an Android tablet or Android smartphone without an Internet connection.

The detailed procedure is as follows: first, a learner listens to the English text for about four minutes. While doing so, she or he can write down words from the spoken text to refer to them in summarizing. After that, she or he thinks about the summary in English for one minute and then says it aloud as pre-summarizing (Figure 3). Second, the learner checks the word list on the screen (Figure 4). These are words used in the text, and the learner is supposed to use them to tell the summary. The learner chooses the words that she or he could use during the pre-summarizing task and marks them in the checkboxes. Third, the screen shows the whole text so that the learner can confirm the context. Fourth, the learner answers five or six short questions that the application vocalizes (short-question and answer practice, which is shown in Figure 5). These questions are related to the main points of the text. The learner goes through this step twice. Fifth, the learner does the summarizing task again as main-summarizing. Sixth, the learner chooses the words that she or he could use during the main-summarizing task and marks them in the check-boxes.
boxes. Seventh, the screen shows the information for the learner to reflect on (Figure 6): (1) the word list and the specific words the learner could use in the pre- and the main-summary, (2) the recorded summaries, and (3) the sample summary. The learner confirms the words that she or he has become able to use and that she or he could not use in pre-summaries and the main summarizing, and compares her or his summary to the sample summary. The procedure, from steps one through seven, is “one session” and it takes about 30 minutes.

5.2 Materials

Table 1 shows an example of scaffolding materials that helps learners for their summary. We designed the materials in the following way. First, we created a sample summary and set some main points of the text that it is necessary for learners to include in the summary of the text. Second, we composed a question for each main point that would encourage learners to mention the main point by answering the question (guiding short questions). Third, we created a sample answer for each question and extracted some words that would be necessary to answer the questions, called “recommended words.” By answering these questions and confirming the sample answers, learners would be stimulated to understand important points gradually in order to modify their summary and use the recommended words.

The summary points, questions, and sample answers in the short-question and answer practice, and the recommended words were reviewed by an English teacher who is not one of the authors of this paper and who teaches English at a Japanese university. In addition, all the English texts were recorded by a native speaker. The speaker read the texts aloud somewhat slowly (145 words per minute on average) in order to help learners understand them as well as possible.

In order to design such kind of materials, instructors have to choose original English texts that meet the following two conditions, (1) word and grammar levels of English texts are suitable for learners, and (2) the concept of the texts is not complicated. These conditions enable learners to read and understand meaning of the sentences without difficulties, thus scaffolding can facilitate learners in conceptualizing the text more efficiently.

It is not so difficult for instructors to choose original texts and design scaffolding materials.

When choosing the original texts, instructors can use English textbooks which are a lower level than the learners’ current learning phase. For example, we selected texts for MALS from high school English textbooks, because current target learners are undergraduate and
graduate students. Moreover, in order to satisfy the second condition more certainly, in this research we selected the texts about the lives of historical figures and environmental problems and removed poems and tales.

In terms of designing scaffolding materials, instructors can extract main points of the texts easily if the texts are satisfied with the second condition: simple and concrete concept. Therefore, we expect that instructors can easily choose the texts and produce scaffolding materials.

5.3 Features and Design of MALS

By utilizing the scaffolding materials mentioned in section 5.2, MALS is able to offer scaffolding functions as follows.

(a) The function for guiding learners in noticing what they cannot express in English while telling a summary. In the pre-summary speaking screen ([1] in Figure 2 and the screen shown in Figure 3), learners have to tell the summary at the beginning of the learning process without any help. Thus, they can begin to recognize the gap between their English knowledge and the knowledge they still need, so the function encourages learners to pay attention to the input that follows for the main summarizing task. As a result, learners might be able to utilize the exercise when conducting the main-summary.

Table 1. Example of Scaffolding Materials.

| Main Points of the Text | Guiding Short Questions | Sample Answers | Recommended Words | Sample Summary |
|------------------------|-------------------------|----------------|-------------------|---------------|
| Influence of global warming | How much influence does global warming have? | Global warming has serious influence on the earth and human beings. | serious, have influence on | Global warming has serious influence in many ways, changing physical features of the earth and destroying its ecology, and health of human beings. The causes are industrialization and increasing human population, which have led to increasing emission of CO₂ and other chemicals. The solution for global warming depends on governments’ eco-friendly policies as well as efforts of individuals to reduce CO₂ and pollution and save limited resources. |
| The root causes | What are the root causes of global warming? | The root causes are industrialization and increasing human population. | industrialization, population |
| The proximate causes | What are the proximate causes of global warming? | The proximate causes are increasing emission of CO₂ and other chemicals. | proximate, emission, chemical |
| The solution for global warming by governments and individuals | What does the solution for global warming depend on? | The solution for global warming depends on governments’ eco-friendly policies as well as efforts of individuals to reduce CO₂ and pollution and save limited resources. | solution, depend on, effort, individual, reduce, pollution, resource |

(b) The function for recognizing the recommended words for telling the summary. The screen of the recommended word list ([2] in Figure 2 and the screen shown in Figure 4) shows the words as a hint. The function motivates learners to use these words. The short-question and answer practice follows the recommended word list.

(c) The function that enables learners to confirm each main point of the text and to practice using the recommended words. A short-question and answer practice offers this scaffolding as follows. MALS vocalizes one of the guiding short questions and a learner answers it (on the upper side of Figure 5). Then, the screen shows the question, the sample answer, and the recommended words (on the lower side of Figure 5). By repeating this process, learners can recognize the main points of the text gradually and practice using the recommended words.

(d) The function for checking the learning achievement and reflecting on the learner’s summary. MALS offers information to encourage the learner to reflect on the recommended words and on the summary. Regarding the words, on the screen of the recommended word list after the pre-summarizing and the main summarizing ([2] and [6] in Figure 2), learners tick the checkbox for the particular words they could use in telling the summary and MALS saves the marked words.
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(Figure 4). Then, the upper side of the screen for reflection ([7] in Figure 2 and the screen shown in Figure 6) shows a table of the recommended words based on what MALS saved. The circle symbol shows that learners could use the word, and the X symbol shows that learners could not use it. Learners can thus recognize what kinds of words they can use through this practice. As for telling the summary, MALS records the learners’ spoken summary on the summary speaking screen. Following that, learners can listen to the summary and compare it with the sample summary on the bottom of the reflection screen (Figure 6).

Through these functions in MALS, learners can conduct the summarizing task through self-study. Moreover, learners may become able to generate preverbal massages in the Conceptualizer and access lexical items in the Lexicon more easily in speaking the summary. Thus, learners may decrease their cognitive load in creating preverbal messages and get help accessing the necessary lexical items more easily, which may lead to their paying more attention to the syntactic process.

6. Experiment

6.1 Objective

We conducted an experiment to observe the effectiveness of the system for fluency, particularly the function for promoting grammatical encoding.

In order to clarify the effectiveness of the summarizing and the scaffolding that help learners concentrate on grammatical encoding, we developed a system in which participants read aloud the texts as a control group. We describe the system in detail in the next section.

We implemented pre-, post-, and delayed-tests, and compared the fluency scores of participants who used MALS with the scores of participants who used the system for reading activities.

6.2 The System for Reading Activities for the Control Group

Figure 7 shows the procedure of the system for the control group. First, the participant listens to the text. Second, the participant reads aloud the whole text that is shown on the screen. Third, the participant reads aloud sentences one by one that show the main points of the text. Fourth, the screen shows each sentence, which is the same as in the third step except that in this step there are blanks in place of the recommended words (Figure 8). The participant fills in the blanks with the words and reads aloud all the sentences. After that, she or he chooses the words that could be used to fill in the blank and marks them in the checkboxes. She or he repeats this step twice. Fifth, the participant reflects on her or his learning achievement. The screen shows specific words that the learner could use to fill in the blanks in the reading activities.

Following Levelt’s model(9), this system for the control group was designed to promote the process of phonological encoding in the Formulator and the process for emitting audible sounds in Articulator, both of which are following grammatical encoding. The system shows the whole text and the sentences that are the main points of the text in the reading activities so that participants are given information they can use to create preverbal messages and grammatical encoding while reading aloud. In other words, they mainly have a cognitive load consisting of phonological encoding and articulation.

In contrast, participants using MALS are given support for creating preverbal messages and accessing

![Figure 7](image-url)
lexical items, and they have to process grammatical encoding, phonological encoding, and articulation independently. Therefore, we can observe the effectiveness of focusing on grammatical encoding in MALS by comparing the two groups.

In addition, the system for the control group offers fill-in-the-blank questions in the reading activity because we presumed that participants in the experimental group might acquire the recommended words through summarizing and doing the short-question and answer practice. We attempted to offer the control group practice for learning the words in a similar situation as that of participants in the experimental group. We could confirm no differences in vocabulary knowledge related to the texts between the two groups by conducting the Vocabulary Test and comparing the scores.

6.3 Procedure of the Experiment

Figure 9 shows the procedure of the experiment. On the first day, participants received instruction on the research objective and procedure. After signing the consent form to take part in the experiment, they took the pre-test. Participants were divided into two groups randomly: the experimental group and the control group. We lent each participant one Android tablet (Nexus 7) that was installed with either application. Second, participants used the application and carried out the activity (summarizing or reading aloud) for six consecutive days at their home. They learned one text through doing the activities (one session) each day. Third, within three days from the last day of using the system, participants took the post-test. Fourth, one week after the post-test, participants took the delayed-test. Finally, we conducted a semi-structured interview with all the participants.

6.4 Data Collection in the Tests and the Interview

We collected data about the participants’ fluency scores and vocabulary scores by conducting pre-, post-, and delayed-tests, and also gathered data about their impressions of the system by conducting a semi-structured interview. Participants took the Speaking Test and the Vocabulary Test by using the Android application, and their answers were recorded with the Android application. The interview was recorded with an IC recorder.

We conducted the Speaking Test and the Vocabulary Test to clarify the effectiveness of MALS in promoting grammatical encoding for fluency. In the Speaking Test, participants were asked to say six sentences that could be described by using words related to the texts used in MALS but that were not similar to the texts. The Vocabulary Test was conducted to measure knowledge of words related to the texts. Therefore, we could evaluate the effectiveness of MALS by observing the differences between the groups, taking account of the relative vocabulary knowledge score.

We measured participants’ fluency by the Speaking Test. We evaluated three dimensions as fluency scores based on a review by Tavakoli and Skehan (16): (1) Speech Rate that is measured by counting the number of non-repeated words per minute (17); (2) Repair Fluency that is measured by counting the repetitions of exact words, syllables, or phrases, reformulations/false starts, corrections/grammatical repair[s], and partial repeat[s] (17), but...
not including reformulations/false starts because they also occur naturally in the speech by native speakers\(^{18}\), and (3) Silence that is measured by counting silences that last 0.4 seconds or more\(^{17}\).

In the Speaking Test, the screen of the Android application showed Japanese sentences one by one, and participants spoke each one in English. Figure 10 shows the screen. Participants read the Japanese sentence and thought in English for 40 seconds, and then spoke the sentence in English for 20 seconds. They said 6 sentences in the test.

We also implemented the Vocabulary Test to confirm no differences in vocabulary knowledge about the texts used in the system between the experimental and the control groups. We measured three dimensions of vocabulary knowledge: “form and meaning,” “spoken,” and “grammatical functions”\(^{19}\), and scored one dimension as one point. We calculated the sum of these three dimensions as the vocabulary score. The test contained 23 items, and the maximum score was 69.

In the Vocabulary Test, the screen showed a sentence that had blanks for recommended words, and participants were asked to fill in the blank by saying the correct word. The blanks showed the first two or three letters of each word as a hint. Figure 11 shows a sample of the Vocabulary Test. This method is based on the study by Laufer and Nation\(^{20}\), which measured whether or not the examinees could retrieve and use the words.

The semi-structured interview was conducted after the delayed-test in order to observe the usefulness of the short-question and answer practice, and to gather participants’ impressions of the learning method and the system. We asked participants in the experimental group (1) how difficult the summarizing task was, (2) how useful the short-question and answer practice was for the summarizing task, and (3) for how long each day and for which topics of the texts did they want to keep practicing. We also asked all participants how difficult the texts were to listen to and read.

6.5 Outline of the Experiment

We conducted the experiment from October 2014 to December 2014. Participants were Japanese undergraduate and graduate students with math and science majors. They were second, third, or fourth year undergraduates, or first or second year masters course students. The mean age was 22.3 (\(SD=2.7\)). In terms of their English scores, the mean score of Test of English for International Communication (TOEIC) was 642 (\(SD=127\)). We note that the test dates for their TOEIC score differed among the participants.

Forty-five participants initially joined our experiment, but the data for nine people were not included in the analysis because four of them withdrew from the experiment, the log data for the home learning of three people were not recorded and we could not confirm their learning activities, and two of them had trouble with the tests. Therefore, we analyzed the data for 36 people (20 for the experimental group and 16 for the
control group).

7. Results and Discussion

7.1 Results of Fluency Score

We analyzed each dimension of the fluency scores by a mixed two-way repeated measures ANOVA using two variables. The between-subjects factor is “learning method,” which has two levels (summarizing and reading aloud) and the within-subjects factor is “test term,” which has three levels (pre-, post-, and delayed-tests). Table 2 shows the results. Figures 12, 13, and 14 show the changes in the average scores in each dimension.

In terms of Speech Rate, significant differences were shown on the “test-term” factor ($F(2, 68)=32.659, p<0.01$). Therefore, we assessed the results with Ryan’s multiple comparison procedure, and the scores of the post- and delayed-tests were higher than those of the pre-test. As seen in Figure 12, the scores of both groups changed in a similar range.

In terms of Repair Fluency, interaction between “methods” and “test terms” showed statistically significant differences ($F(2, 68)=3.543, p<0.05$). Therefore, we did tests of simple main effects. The results for the “test-term” factor in the experimental group showed significant differences ($F(2, 38)=7.634, p<0.01$), and the Repair Fluency in the post-test was lower than that in the pre-test, in the multiple comparison procedure. The results are shown in Figure 13.

In terms of Silence, significant differences were shown on the “test-term” factor ($F(2, 68)=28.164, p<0.01$). Therefore, we assessed the results with Ryan’s multiple comparison procedure. The results revealed that the silent time of the delayed-test was lower than the times of pre- and post-tests, and the silent time of post-test was lower than the time of pre-test. As seen in Figure 14, the scores of both groups changed in a similar range.

7.2 Results of Vocabulary Knowledge Score

We analyzed the Vocabulary Test scores by a mixed two-way repeated measures ANOVA using two variables. The between-subjects factor is “learning method,” which has two levels (summarizing and reading aloud), and the within-subjects factor is “test term,” which has three levels (pre-, post-, and delayed-tests). Table 3 shows the results, and Figure 15 shows the changes in average scores for both groups.

The “test-term” factor showed statistically significant differences ($F(2, 68)=187.064, p<0.001$). Therefore, we assessed the results with Ryan’s multiple comparison
procedure, and the scores of post- and delayed-tests were higher than those of the pre-test. As seen in Figure 15, the scores of both groups changed in a similar range.

7.3 Results of Semi-structured Interview

As for the usefulness of the short-question and answer practice, 19 out of 20 participants in the experimental group said that the practice was useful for making sure they understood the main points of the text. Although 11 of the participants in the experimental group said that “summarizing” was difficult, they were able to comprehend the main points of the texts and give the summary with the scaffolding, according to their remarks in the interview. Moreover, many of the participants also said that reading a whole text after listening to it is important for understanding the context.

As for motivation to continuously use MALS, 11 participants in the experimental group said that 30 minutes of learning was suitable, while 9 participants wanted to continue to use the system if the learning time per day was less than 30 minutes. In terms of the genres of the texts, 13 participants wanted to do the summarizing task with newspaper articles, while 3 participants preferred high school English texts. Four participants wanted both.

As for the difficulty of the texts, 26 participants said that they could understand the texts by listening to them. Nine participants felt that some of the texts were not so easy to listen to but that they could understand them by reading the whole texts. One participant said that the texts were neither difficult nor easy.

7.4 Discussion

After the analysis, we concluded that learners can conduct the summarizing task through self-study more effectively by using MALS and that practice with MALS is effective for improving fluency.

Concerning self-study, although 11 out of 20 participants in the experimental group said that some of the texts were not easy to summarize, 19 out of 20 participants said that the short-question and answer practice was useful and effective for confirming and modifying their summary. Therefore, the scaffolding is useful in decreasing learners’ cognitive load and enables learners to do summarizing on their own by helping learners in conceptualizing the text and retrieving necessary words, which can result in increasing their effectiveness in doing the summarizing task.

In terms of effectiveness for fluency, MALS was effective for all three dimensions of fluency, while reading activities could improve only Speech Rate and Silence. As seen in Figure 12, Speech Rate of the post-test increased significantly compared with that of the pre-test for both groups. As seen in Figure 14, the post-test scores of Silence decreased significantly for both groups compared with the pre-test scores. These results showed that both MALS and reading aloud were effective for improving Speech Rate and Silence. In contrast, as seen in Figure 13, Repair Fluency of people only using MALS decreased in the post-test compared with in the pre-test, while the score of the participants of the control group did not change. Consequently, MALS was effective for improving Repair Fluency, while reading aloud was not.

Collectively, these results suggest that when focusing on summarizing and reading aloud, summarizing could improve more aspects of fluency than reading aloud. We explain the reason for this by showing differences among the activities in the next paragraph.

As for the activities in both groups, they practiced using recommended words and spoke sentences aloud repeatedly. As a result, they could retrieve the lexical items related to the texts from the Lexicon, process sentences phonologically, and articulate them audibly faster and more effectively. These changes might have reflected on the results of Figure 12 and Figure 14 as the scores of Speech Rate and Silence. The results of the Vocabulary Test also showed that the participants of
both groups could come to use the lexical items related to the texts after their six-day practice.

On the other hand, the participants using MALS also conducted practices that promoted grammatical encoding, while the participants of the control group did not. In the summarizing speaking task, the participants using MALS had to construct sentences grammatically on their own during a limited time. As a result, they might have become better at constructing the sentence structure accurately for them. We provide more details in the next paragraph by showing typical examples in the Speaking Test.

In the pre-test, one of the participants using MALS spoke in this way, “Jane comes from foreign, a foreign country and her educational system, system which, which may, which improves presentation skills...”. The participant repeated the same words two times and corrected grammar once in the pre-test (“which may, which improves...” is not counted as a repair because reformulations/false starts also occur naturally in the speech by native speakers[18]). At first, the participants might have taken much time to construct grammatically what they wanted to express because they might have been able to process grammatically only the limited number of words simultaneously. As a result, they might have repeated the same words until the next encoding was finished.

On the other hand, in the post-test the same participant said, “Jane, who is a student from foreign country, developed the system to improve the presentation skill and then got a lot of...”. The participant did not repair the speech in the post-test. We inferred that this kind of improvements came from decreasing the participants’ cognitive load in grammatical encoding. By conducting practice that promotes grammatical encoding, they might have become able to process grammatically faster. Therefore, they could speak with less repetition. This improvement was likely to be seen in Figure 13, as the score of Repair Fluency.

In terms of sustained effectiveness for fluency, the six-day MALS practice might be too short to acquire processing for speaking automatically because in the experimental group, there were no significant differences between the score of the delayed-test and that of the pre-test for Repair Fluency, as seen in Figure 13.

In sum, MALS could increase the abilities for constructing the sentence structure, retrieving particular words, and speaking speed, while reading aloud could improve the second and the last ones.
The results of our research have three implications. First, in order to maximize the effectiveness of the summarizing task in self-study, it is important to offer scaffolding that decreases cognitive load in conceptualization for summarizing and retrieval of necessary words. The scaffolding enables learners to concentrate on grammatical encoding which results in improving fluency in second language.

Second, in order to decrease the frequency of repair in speaking and to keep the improvements, supporting systems should motivate learners to continue practice frequently. Learners need more practice in a longer term for acquiring automaticity of processing. In order to increase their motivation and keep the practice, adding various genres such as newspaper articles and letting learners control their learning time might be one of the strategies.

Third, the method with MALS seems more suitable for novice and intermediate learners than advanced learners. A lot of novice and intermediate learners have difficulty in processing basic grammatical encoding in speaking. In order to support practice basic grammatical encoding, MALS offers scaffolding that enables learners to concentrate on linguistic form by facilitating learners in conceptualization for summarizing and retrieving the necessary words. In contrast, learning tasks for advanced learners might require them to conduct more challenging activities such as speaking their own opinion or explaining more abstract knowledge. Therefore, MALS is more useful for novice and intermediate learners.

8. Conclusion and Future Studies

In this research, we developed MALS, which offers learners scaffolding for summarizing in their self-study and enables them to concentrate on grammatical encoding, and we investigated what kinds of dimensions in fluency the system is effective for.

The results of the experiment revealed that (1) scaffolding of MALS could enable learners to conduct summarizing through self-study, and (2) the summarizing task with the scaffolding, at least in the present form, was more effective than reading aloud in decreasing frequency of repair in speaking, which results in improving fluency.

We propose three directions for future studies. First, more experiments over the long term with more analysis are needed. We must analyze the effectiveness of this system when learners use it for a longer period of time. Moreover, we have to observe the effectiveness for other dimensions of speaking skill. Second, we must improve the learning design in order to encourage learners to keep practicing English-speaking with this method. For example, our related research suggests that additional design of the learning system for motivating learners’ self-efficacy and promoting their reflection on their achievement might increase frequency of their learning. Third, we should elaborate the strategy for preparing materials. This research is focused on novice and intermediate learners who have difficulties in encoding the basic structure grammatically in speaking. On the other hand, another method is needed to choose the original texts and prepare materials for advanced learners.

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