E-LEARNING FOR ENGLISH LANGUAGE SPEAKING SKILL

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Abstract

We here discuss an e-learning for English speaking skill. The learning system aims at improving the speaking skill through memorization of short sentences. The method of the system is as follows: 1. A short sentence in the learner's mother tongue is either displayed on a computer monitor, or is communicated by audio. 2. The learner translates the sentence quickly. 3. The system displays the correct answer. 4. The system then selects and displays another short sentence from the collection.

The steps shown above are repeated. All what the learner has to do is total memorization of all translations.

We evaluated the learning effectiveness of the method with the e-learning by asking few participants to use the system. For the evaluation, we created short sentences and equally divided them into Set A and Set B. Set A contained sentences that are to be learned, and Set B contained sentences that are not to be learned. The participants were subjected to pre-test and post-tests containing sentences from both sets. The participants' vocal answers for both pre and post tests were evaluated in terms of fluency. The evaluation revealed that not only did the participants improve their speaking skills for the sentences in Set A (direct effect), they showed improvements toward sentences in Set B (indirect effect). More specifically, indirect effects were observed for 7 out of 9 sentences as a statistical significance.

Keywords: *E-learning, Language education, Evaluation, Speaking skill*
ACM classification: K.3.1, J.5

1. Introduction

This paper deals with *a learning system designed to improve English speaking skills of the students*. In this learning system, the goal of the students is to memorize all English translation of short Japanese sentences in accordance with the method described below.

First, a computer selects a short sentence from a collection of sentences in a particular theme and then presents it to the student (either visually on a monitor or through audio). The computer then encourages the student to answer in English. The computer will then display the correct answer (either on monitor or using audio) upon request from the student. The student then tries to memorize the correct answer. Through these basic autonomous steps, the system aims to help the student achieve fluent command of English expressions.

This paper discusses the design principles behind the randomized selection of the short sentences used in the system as well as the learning effectiveness through memorizing the sentences using the learning system.

There are many perspectives on language speaking skills. Some argue that there is a direct correlation between memorization of short English sentences (Kitagawa, 2003), and others argue that speaking skills ought to include an ability to interact with others on top of pure linguistic skills (Nakamura, 1993). This research is closer to Kitagawa's (1993) since we see memorization of short English sentences as a method of improving one's speaking skills. It is also similar to the perspective of Pawley et al. (1983) that states that memorizing numerous clauses and phrases will lead to fluency.

2. Learning flow and the learning contents

In this research, we have randomly selected the sentences to be memorized. We had decided to utilize computers to make random selection easy. Here, we will discuss the reasoning behind adopting randomly selected sentences.

The first reason is that we considered the students` motivation to learn. In a normal printed learning material, the sequence of example sentences is fixed. However, randomization of the sequence of the subject sentences heightens the students' sense of anticipation, which hopefully leads to higher learning motivation. It is said that heightening spontaneous motivation is important to language studies. Randomization of the sequence of sentences can potentially heighten the spontaneous motivation of the students (Deci, 2002; Little, 1995).

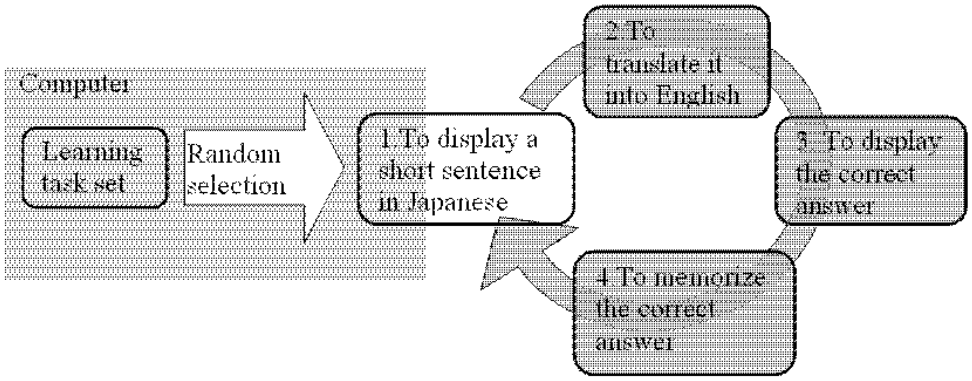

Figure 1. *Learning flow*

The second reason is the fact that sequence of conversation is rarely fixed in real life interactions. A real life situation always has incidental and unpredictable occurrences. This corresponds to randomization of the sentences. In a conversation, one often talks about things that they just happen to remember. Also, it is expected that speakers answer unexpected questions without being thrown into confusion. Therefore, a learning style that creates incidental situations and forces students to deal with those situations is logical.

The third reason is that the students have an option to let the computer system sequence the available learning subjects semi-randomly. Students can register their attribute values according to their attributes like their sex and age prior to starting the learning process. Also, each learning subject is characterized

on the base of such attributes, and the system developers can set attribute values to each learning subject according to their contents. Computer then compares attribute values of the student to that of the learning subjects to set the probability of displaying a sentence from a particular learning subject. Using this method, a student increases the selection probability of a learning subject that is more relevant to the students. In addition to the above described time-independent attributes, the learning system also has time-dependent attributes. Using time-dependent attributes, the system adjusts probability of selecting a certain sentence from a certain learning subject according to the season the students access the system, or the time of the day the students use the system. In other words, the system can select learning subjects by considering each student's attributes.

Although the proposed system permits semi-random selection as an option, we here used the random selection as the experiment was supposed to be basic. (*The algorithm of semi-random selection explained above is shown in the Appendix*).

Figure 2. *Display screen*

Based on the above discussed principles, we opted to randomly select the sentences as shown in Figure 1. As an example of the display, Figure 2 shows the display when the answer is shown (step 3 of Figure 1). The area in the middle displays the sentences and answers. Hints also get displayed in the same area. The left hand side of the display is the command area, where *listen to the answer* and *read the answer* buttons are located. On the bottom of the screen is the area where users can type texts. Figure 2 shows the display after clicking on the *read the answer* button to display the English translation of the Japanese sentence shown.

The Japanese short sentences were written based on the central theme of an international conference. Approximately 100 conversational sentences were written based on experience of the authors. The sentences were divided into 5 levels, from level 1 to level 5. The level designations were done based on sentence length and complexity of the sentence structure. Most of the sentences are accompanied by explanations of the situations. English translation and narrations in Japanese and

English were done by professional translators and narrators. From the 5 levels, we used levels 1, 2, and 3 in this research. Examples of the learning sentences are shown below. Situations are described in parenthesis.

Level 1: (When I was asked at the get-together party held by the scientific society, which university am I working for?) Last year I resigned from my university.

Level 2: (One scene of presentation of a paper.) We repeated the experiment many times, but the major results are shown in this chart.

Level 3: (I made a humorous comment as the moderator.) We are already in the 3rd evening of the conference, and everybody must have become tired. If you feel tired, I do not mind that you may fall asleep, but I'd like to have your cooperation in not having any snoring.

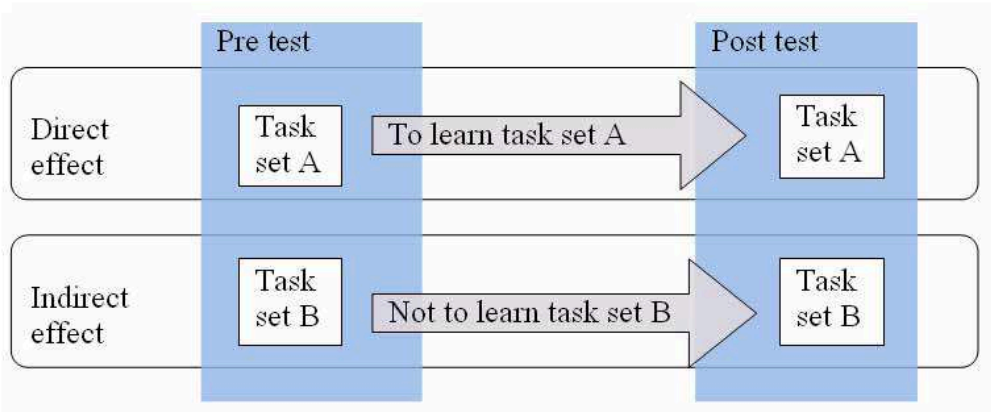

Figure 3. *Direct/indirect effect of learning*

3. **Experiment design and analysis**

For this experiment, evaluation standards for such things like fluency was set based on evaluation standard for English speaking skills utilized by Baba et al. (2003). We will discuss the experiment design for measuring learning effectiveness and data analysis.

3.1. *Preparation of experiment and method of learning*

[Preparation of the sentences] Figure 3 shows the framework of the experiment. Task set A, which are to be memorized, and Task set B, which are not to be memorized, were both utilized for pre and post tests. The sentences in levels 1, 2, and 3 as discussed previously were divided into Task set A and Task set B. The central theme used for the task set is an international conference as mentioned before. Also, because it was predicted that memorization of the sentences would be extremely difficult, the number of sentences were limited to 13 sentences for both Task set A and Task set B. The displaying of sentences for pre and post tests was done within the learning system.

The increased score in post test compared to that of pre test can be attributed to the effectiveness of randomization using the system to improve fluency.

Hereafter, we will refer to the increase in score on Task set A as the direct effect, and the increase in score on Task set B as the indirect effect.

[Participants] Five university students (referred to as a, b, c, d, and e)

They all claim to be highly motivated, but have difficulties with speaking English. Their TOEIC scores range from 500 to 600.

[Experiment] The experiment was conducted in the sequence described below.

1. As a pre test, they were shown Japanese sentences from Task set A and Task set B that were classified as level 2, and then they were asked to recite them in English. Twenty six sentences from Task set A and Task set B were shown to the participants alternately from each task set.

2. Whether sentences from level 2 were at an appropriate level for memorizing for a particular participant was decided during the test (or after the test completion) with discussions with the participants. If the participants decided that the level 2 sentences were too difficult for them, level 1 sentences were given to the participants as pre test. All verbal answers were recorded.

3. The Task set A for the level determined in step 2 was given to the participants to memorize. It was told to the participants that the goal is for them to be shown Japanese sentences and be able to recite them in English. The students were also instructed to dedicate 30 to 60 minutes to studying daily, but they were to decide how, in the time, they would study. It was explained to the participants that the learning system consists of Japanese audio function, English audio function, and typing input function in the text input field. The participants were given freedom to use specific aspects of the learning system.

As a reference material to determine whether to discontinue the learning, the participants were asked to self-evaluate the degree of memorization for each subject sentence from 1 to 5, and record this self-evaluation on a given sheet.

4. The participants were asked to study the level mentioned in step 3 for a few days. After few days of studying, we determined whether the participants should continue to study the next day based on their self-evaluation of their learning progress.

5. If it was determined that a participant should discontinue studying in step 4, post test was administered right away. The contents of the post test were same as the pre test. Because the learning display would show both sentences that the participants studied and the sentences that they didn't study, the participants were told that they can verbally answer sentences that they have memorized, or sentences that are easy for them to say. All verbal answers given by the participants were recorded.

6. After completing the post test, some participants were asked to go through tasks 1 through 5 for sentences that are one level higher.

[Recording and learning environment] Since the material to be learned is related to speaking, the participants were asked to study in a private room to aid their concentration. Equipments used for playing the learning subject sentences and recording are described below:

Play back: Epson Endeavor NA101 (Windows XP), SOTEC Multi Media Speaker System Model JSS31-G1

Recording: SONY F-U420 (Microphone), Marantz MODEL PMD671 (Digital recorder)

3.2. *Organization of verbal answers*

Three participants a, b, and c studied 2 levels. Participants a and b studied levels 2 and 3, and participant c studied levels 1 and 2. The cases 1 through 6 in Table 1 correspond to these results. Participants d and e studied level 2 only. These results are shown as cases 7 and 8 in the same table. Column (b) in the table shows the number of days that the participants required for completing each case. Case 6 in Table 1 shows B' in the "task set" column. This is a task set of sentences related to indirect effect. The number of sentences are recorded as 26 for the below described reasons. Participant c took pre test for level 2 prior to studying level 2 material. However, it was determined that level 2 is too advanced for the participant. Hence level 1 was chosen as the learning subject for the participant. The participant then took pre test for level 1, memorized level 1 material, and then took level 1 post test. After that, the participant took pre test for level 2 once again prior to advancing to level 2 material. Therefore, the participant took level 2 pre test (26 sentences) prior to studying level 1, as well as after studying level 1 material. As a result, these 26 sentences would have had an indirect effect on level 1 measurement.

Let us denote: A - learning task set for direct effect measurement, B - learning task set for indirect effect measurement, s_p - average score of pre test , s_q - average score of post test, σ_p^2: distribution of pre score, and σ_q^2: distribution of post test score, ***:p<0.001, **:p<0.01, *:p<0.05 (one side test), and

$$Z = \frac{s_p - s_q}{\sqrt{s_p / \sigma_p^2 + s_q / \sigma_q^2}}.$$

Table 1. *Evaluation of English speaking*

(a) case	(b)evaluation object (day of the administration)	(c) task set	(d)s_p	(e)s_q	(f)Z-value
1	Subject a, task level 2,l studied 2 days in a rowl	A	1.23	3.38	-9.14***
		B	1.31	2.08	-2.25*
2	Subject a, task level 3,l studied 4 days in a rowl	A	1.23	4.00	-14.33***
		B	1.23	2.15	-3.21***
3	Subject b, task level 3,l studied 2 days in a rowl	A	1.92	4.08	-8.14***
		B	1.85	2.31	-1.48
4	Subject b, task level 3 (6 days. However, studied for 4 days straight, took 1-day break, and then studied 2 days in a row again)	A	1.39	4.08	-10.7***
		B	1.54	2.00	-1.89*
5	Subject c, task level 1,l studied 2 days in a rowl	A	2.31	4.69	-10.04***
		B	2.15	2.92	-2.62**
6	Subject c, task level 2,l studied 4 days in a rowl	A	2.54	4.69	-8.85***
		B	2.54	3.00	-1.65*
		B'	1.88	2.54	-2.00*
7	Subject d, task level 2,l studied 2 days in a rowl	A	2.23	4.77	-12.8***
		B	2.39	3.08	-1.92*
8	Subject e, task level 2,l studied 2 days in a rowl	A	2.15	4.77	-9.09***
		B	2.00	2.39	-1.21

3.3. *Evaluation and analysis*

Improvement in fluency was evaluated quantitatively using the verbal answers as described in the previous section. The evaluator was an American engineering postgraduate student. Evaluation standard as described below were shown to the evaluator, and the evaluator was asked to follow the standard. The evaluator was asked to evaluate fluency of the participants as non-native English speakers between the scores of 1 and 5. The evaluation results are shown in Table 1, (d) through (f). Z-score is a statistical value that is used to test differences in means. The test result is shown in the last column of the table.

The table shows significant direct effect for all cases. Also, there are significant indirect effect in 6 cases, namely cases 1, 2, 4, 5, 6, and 7 of Task set B.

The experiment showed significant improvement in fluency by memorizing English translation of specific Japanese sentences using the learning system presented in this study (direct effect). Not only that, improvement in fluency was detected for those sentences that were not in the task set for memorization (indirect effect). This result suggests that memorizing English translation of specific sentences help facilitate improvement in speaking skills in much broader sense. The breadth of such effect should be researched through further studies.

Additional evaluation was made from a perspective of sense of similarity of contents in addition to fluency through verbal responses. The sense of similarity of contents referred to here represents if the answers given by the test participants contain the same information in the correct answers in a just-proportion. The similarity referred to here does not concern grammatical structure or vocabulary. However, only 2 cases out of 8 cases shown in Table 1 showed significant improvement (1 case each was determined significant with $p<0.001$ and $p<0.05$).

4. **Discussions**

In this research, we were able to obtain results of using the learning system that supports memorizing English sentences for purpose of improving English speaking skills.

Let us discuss the differences and similarities between this learning method relative to other learning methods.

One of the characteristics of this system is memorization of short English sentences. Necessity of memorizing vocabulary and phrases for language learning have been shown experimentally. With that, several learning systems based on memorizing individual words have been developed (Ma, 2006; Nakamura, 1993). However, it is difficult to find past research examples for studying memorizing sentences. There is a case of using the memorization technique from the civil service examination in imperial China to memorize relatively long sentences (Kitagawa, 2003). The paper discusses very interesting memorization method through personal experiences, but the paper does not study the method empirically. On the contrary, some computer systems support practicing speaking through responsive reaction (Yoshida et al., 2008).

From above, we can say that current method for practicing speaking a foreign language either emphasizes memorization (Kitagawa, 2003 Pawley, 1983) or reaction (Yoshida, 2008). This research would be grouped with the former.

Another characteristic of this system is the randomization of sequence of learning subject sentences. Section 2 discussed that one reason for adopting randomization is for student's motivation to learn. The section also discussed that computer was used to make randomization easier.

In the research discussed here, we have obtained experimental data of improvement of English skill, which can be used for a user to make sure how much the learning will be effective if he/she learns English sentences by role using the system. However we have not yet compared the effectiveness of the learning with the proposed system and that without the system. Related experiment ought to be done in the future.

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Appendix

For the objective of making the algorithm of semi-random, we give the learning task a framework of task attribute which characterizes the task. We also give a user the same framework as the learning tasks. Task attribute refers to a variable characterizing the task. The attribute consists of (learning) level attribute, non-time attribute such as learning level, gender, generation and time attribute such as season, time in a day. Actually access time to the computer is used for determination of time attribute.

We here consider how the ith task ($i \in I$) matches the situation of user 'u'. We designate the value for the kth partition ($k \in K$) in the jth non-time attribute ($j \in J$) in the ith task as $s(i, j, k)$. And for user 'u', we also do the value of the kth partition of the jth non-time attribute as $u(j, k)$.

[1] $0 \leqq s(i, j, k) \leqq 1;\ 0 \leqq u(j, k) \leqq 1$

For the same user 'u', we designate the kth partition of the jth time attribute as $u_t(j, k)$.If the access time got in the k_0^{th} partition, we set the following equations:

[2] $u_t(j, k) = 1$ for $k = k_0$; $u_t(j, k) = 0$ for $k \neq k_0$.

We also designate the value of the kth partition of the jth time attribute in the ith task as $s_t(i, j, k)$.

[3] $0 \leqq s_t(i, j, k) \leqq 1$

Level attribute is designed to be set both for mother language and translation language in i^{th} task, the attribute values of which are designated as $d_a(i)$, $d_b(i)$, respectively. On the other hand, we designate learning level set by the user as d_u, where

[4] $0 \leq d_a(i) \leq 1,\ 0 \leq d_b(i) \leq 1,\ 0 \leq d_u(i) \leq 1$

hold good.

For the description above, we define situational matching μ_i for the ith task as based on α_i : matching of non-time attribute ($0 \leq \alpha_i \leq 1$), β_i : matching of time attribute ($0 \leq \beta_i \leq 1$), γ_i : matching of level ($0 \leq \gamma_i \leq 1$).

[5] $\mu = \alpha \wedge \beta \wedge \gamma$,

[6] $\alpha_i = \bigwedge_{j \in J} (\bigvee_{k \in K} (s(i, j, k) \wedge u(j, k)))$

[7] $\beta_i = \bigwedge_{j \in J} (\bigvee_{k \in K} (s_t(i, j, k) \wedge u_t(j, k)))$

[8] $\gamma_i = 1 - |(d_a(i) \vee d_b(i)) - d_u|$

For the definition above, using [5], we get normalized situational matching as [9]. From [9], we get probability distribution function F of [10]:

[9] $\mu_i^0 = \mu_i \Big/ \sum_{i \in I} \mu_i$

[10] $F(\mu_i^0 \mid i \leq i_0) = \sum_{j \in I_0} \mu_j^0$

where

[11] $F(\mu_i^0 \mid i \leq |I|) = 1$

hold good. And for a random value r_0 (r_0 =[0,1]), the computer selects the i_0-th task satisfying the following [12].

[12] $F(\mu_i^0 \mid i \leq i_0 - 1) < r_0 \leq F(\mu_i^0 \mid i \leq i_0)$

If we use random selection instead of the selection above, we have only to set [13] instead of equation [5].

[13] $\mu \equiv 1$.