

The Relationship between Learning Behavior and Learners' Listening Strategies in Dictation Practice Courseware

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Abstract: This paper explores the possibility of relating psychological factors of learning strategies with log data collected in an online dictation training courseware in Japanese EFL settings. Based on Nix's (2016) learning strategies question items, we conducted an explanatory factor analysis, producing four factors, each consisting of four question items. Spearman's correlation analysis showed a few weak correlations between learning behavior and learning strategies. In conclusion, it is suggested that more parameters of personalized data be included in future Personalization/Adaptation studies based on learning analytics.

Keywords: dictation, listening strategies, adaptive/personalized learning, learning log

1. Introduction

This paper, as a preliminary study, discusses whether log data collected during the listening practice can be related with any of the potential psychological constructs, i.e., listening learning strategies of the learners, and whether the constructs can predict some indexes that explain learner's learning outcomes. Ono (2018) discusses the importance of challenging to explore the possibility that the learning behavior, collected as learning behavior data in an online learning environment, since this might directly lead to the automatized "personalization" and "adaptation" of learners' learning.

However, in the case of foreign language learning environment, it is not at all clear that online learning behavior is related to individual learner factors of learning strategies, especially in the listening practice environment. Ono (2014) pointed out that behaviors such as intentional "skipping" or "repetition" due to irrelevant purposes makes data more complicated and prediction more difficult in terms of the use of authentic multimedia materials such as TED Talks.

In discussing the learning analytic approach to listening tasks, various types of psychological constructs such as learning strategies, learning styles, and learning motivation could affect learning behavior and learning outcomes. In this preliminary study, the main focus will be on the practice of "dictation," whereby the learner listens and writes what they hear. This task is cognitively complicated and involves activation of the processing of grammatical, contextual, and phonological knowledge, implying a discussion of the relationship between learning strategies. The result, which will be laid out in this paper, is that there is a limited degree of relationship observed as a result of Spearman's correlation analysis between listening learning strategies and the certain length of materials to listen to. Lastly, this paper will be concluded with the future research perspectives to explore the potentials of learning analytics to the course design in the classroom.

2. Previous Studies

2.1 *Toward More Sophisticated Personalization of Learning Courseware*

There is a general agreement that the recent emergence of Learning Analytics (LA) as a distinct field from the applied disciplines of Machine Learning, Data Mining, and Intelligent Tutoring Systems, which in turn evolved in large part from the fields of Applied Statistics, Computational Linguistics, and Cognitive Science (Rosé et al., 2016). LA's prominence and influence are strongly activated the interdisciplinary field of the Learning Sciences as a whole, and in particular, the CSCL community (Tan & Koh, 2017). To expand the potential as a research-practice bridge in LA, LA-based Personalization/Adaptation has been intensively researched since then. According to the meta-analytic study by Xie, Chu, Hwang, and Wang (2019), the main parameters of personalized data are learners' preferences, learning achievements, profiles, in addition to learning log data.

It is a fact that language learning is the field in which technology enhanced learning research has been penetrated. However, it is more important to improve accuracy of clustering/prediction models by incorporating further learner factors. Specifically, among the potential factors listed above, Chen et al. (2016) stress the importance of including learning style data in addition to learning behavior data.

2.2 Significance of Dictation Task in Foreign Language Instruction

Compared with reading tasks, listening is considered as a difficult task. According to Field (1999), listening involves two simultaneous processes in the brain: The top-down process and the bottom-up process. The bottom-up process involves understanding words in connected speech, while the top-down process originates from comprehension models such as schema theory, leading to compensation for commonly problematic bottom-up abilities of EFL learners.

Dictation is the process of writing down what someone else has said. Oller (1971) evaluates dictation task as providing the learners with expectancy grammar skills and promoting general proficiency. Heaton (1975) points out that the dictation task predicts such concepts as phonetical discrimination, vocabulary knowledge, grammatical knowledge, listening comprehension and phonological memory span. The task is intended as the activization of both top-down and bottom-up processes. In the field of Japanese EFL research, it is commonly agreed that both processes are interacted in listening tasks: the top-down process is activated especially when the learners cannot understand phonetic information (Satori, 2010).

2.3 Log Data in Listening Practice

The dictation training courseware employed in this study is "CaLabo MX," produced by CHieru[®], Japan (<https://www.chieru.co.jp/products/high-school/calabo-mx/>). The screenshots of the interface are shown in Figure 1. In a typical dictation practice courseware, the supporting modules are included in the interface, so that learners can freely choose how to produce the sound from the system. The modules are listed in Table 1 and described in Figure 2 below. These modules are the parameters for the log-data analysis in this study.



Figure 1. Screenshot of dictation training courseware.



Figure 2. Screenshot of the support modules in the courseware.

Table 1. Parameters to Employ in this Study

①	Seek the place to start to play (Seek)
②	Push the Start/Stop button (Start/Stop)
③	Go back 2 seconds (Back)
④	Go forward 2 seconds (Forward)
⑤	Set the A-B point for repetition (Between)
⑥	Change the speed (ChangeSPD)
⑦	Go to the end and stop (Complete)

2.4 The Comprehensive Model of Listening Learning Strategies

Since Rebecca Oxford’s Strategic Inventory for Language Learning (SILL: 1990) attracted broad attention within the field of second language acquisition, studies of listening strategies have been discussing the constructs or methods of managing personal mental and observable behavior to accomplish a listening task (Goh & Taib, 2006; Graham & Macaro, 2008; Richards, 2008). Nix (2016) constructed a questionnaire called the EFL Listening Strategy Inventory (ELLSI) to estimate the strength of the latent trait and listening strategy use among the population of Taiwanese EFL learners. The model was based on four relevant theoretical facets. These are (i) learning *settings*, that is, situations in which EFL listening may occur (Interaction/Conversation, Self-study, Academic); (ii) *channels* (Face-to-Face, VOIP/Telephony, Webcam, Audio-Visual Media); (iii) *strategies* (metacognitive, cognitive, and socio-affective); and (iv) *processing* (Interactive, Top-down, Bottom-up), followed by 23 constructed and validated question items (given in the Appendix below). This paper tentatively assumes that the 23 question items should reflect Japanese EFL learners’ listening strategies as a comprehensive model. In Study 1, an exploratory factor analysis is conducted, and sophistication into the current study will be attempted.

3. Study (i) Factor Analysis

3.1 Research Questions

With these considerations as background, this paper attempts to explore the possibilities of relating learning log data with any of the learners’ listening strategies.

RQ1: How will Nix’s 23 question items be summarized, in the case of Japanese university EFL learners?

RQ2: What is the relationship between learning behavior and listening strategies in online dictation practice courseware?

3.2 Procedure

A total of 76 first-year students participated in the study in the spring term of the 2020 academic year. The dictation practice courseware was new to all of the students; we therefore designed the first two weeks as training weeks, so that the participants could become accustomed to the system. We collected data from week 5 to week 8 with four different tasks of different sentence lengths. The total log data contained 22,596 lines for analysis. Table 2 shows the summary.

Table 2. *Materials in this Study and Number of Log Lines to be Collected*

Task	Material	Length/Difficulty	Number of logs
1	The shields are designed to protect passengers from the risk of droplet transmission and are made from transparent polycarbonate.	Medium/Difficult	3,872
2	Simplicity is the best. We tried to make them the simplest, effective way of keeping people safe.	Medium/Easy	2,411
3	Estonia is proud of its firsts.	Short/Easy	5,787
4	It lays claim to being the first country to declare internet access as a human right, the first country to hold a nationwide election online, the first country in Europe to both legalize ride sharing and delivery bots, and the first country to offer e-Residency.	Too Long/ Difficult	10,526
Total			22,596

3.3 Results

For RQ1, an exploratory factor analysis was conducted to determine the inter-factor relationship. The maximum likelihood method was employed with a Promax rotation. Sixty items were removed from

the model, based on the following predetermined criteria. Indices were removed from the model if they did not have primary factor loadings that were $\geq .35$, or if the items loaded on more than one factor. A summary of the analysis and the names of each factor is presented in Table 3.

Table 3. *Summary of Items and Factor Loadings for Promax Solution for Listening Strategy Questionnaire*

	Item	Factor loading				Communality
		1	2	3	4	
21	When listening to a difficult passage, I identify chunks of words, or phrases, rather than single words.	.85	-.02	-.01	.04	0.73
20	When conversing in English, I identify chunks of words, or phrases, rather than single words that the other person says.	.79	.10	.18	-.12	0.73
8	I judge how well I was able to understand the other person's speech.	.47	-.17	.14	.16	0.31
23	I use knowledge of English stress and intonation to help me figure out words spoken unclearly.	.36	.29	-.05	-.06	0.26
4	I guess the meaning of unknown words by noticing the speaker's tone of voice.	.00	.82	.10	-.30	0.67
5	I guess the meaning of unknown words by noticing the gestures, actions, or facial expressions of the speaker.	-.13	.65	.16	.13	0.50
19	When listening to a passage in class, I pay attention to my feelings about the passage.	.03	.45	-.07	.22	0.29
18	When listening to a difficult passage outside of class, I group words and expressions together based on common features.	.29	.40	-.33	-.04	0.33
10	I use personal experience to understand the speaker's meaning and intentions.	-.03	.05	.76	.04	0.61
11	I use my knowledge of the world to understand the speaker's meaning and intentions.	.24	-.07	.52	-.16	0.31
7	I guess the speaker's intentions by noticing the gestures, actions, or facial expressions of the speaker.	-.11	.33	.51	.10	0.47
12	I use my knowledge learned from school to understand the speaker's meaning and intentions.	.29	-.10	.41	.11	0.34
2	I listen to the other person's speech to determine if he/she has understood me correctly.	-.01	.04	-.08	.63	0.37
22	I mentally prepare to listen by reviewing what I know and don't know about the topic.	.13	-.06	.05	.61	0.45
14	I figure out the relationship between events when listening to a passage.	.14	.30	-.04	.59	0.61
17	When studying outside of class, I make sure to choose listening passages/materials that I like.	-.15	-.15	.06	.42	0.18
Factor correlations						
	Factor 1	–				
	Factor 2	.38	–			
	Factor 3	.26	.26	–		
	Factor 4	.35	.24	.41	–	

Note. $N=76$. Boldface indicates highest factor loadings. Cronbach's alpha = .71. Description of items is found in Appendix. **Factor 1 = Global Understanding Strategies; Factor 2 = Paralinguistic and Grouping Strategies; Factor 3 = Knowledge and Experience-Based Strategies; Factor 4 = Learning Strategies.**

Regarding RQ2, intercorrelations for scores are examined between the four factors of listening strategies and the calculated scores of each parameter. In addition to the parameters given above, the final score of the match is also included in the parameter. The results of our Spearman's correlation test are given in Table 4, along with the scatter plots.

Table. 4 *Intercorrelations Between Listening Strategies and Learning Behaviors*

Task 1 (Medium length/Difficult)								
	Seek	Start-Stop	Back	Forward	Between	Change SPD	Complete	Score
Factor1: Global Understanding Strategies	.07	.00	-.18	-.11	.03	.00	.224*	.11
Factor2: Paralinguistic and Grouping Strategies	.04	.09	.00	-.10	-.06	.10	.09	-.09
Factor3: Knowledge and Experience-based Strategies	-.07	-.05	-.08	-.10	.04	-.01	.11	.12
Factor4: Learning Strategies	.04	-.19	-.225*	-.02	.04	.15	.14	.16
Task 2 (Medium length/Easy)								
	Seek	Start-Stop	Back	Forward	Between	Change SPD	Complete	Score
Factor1: Global Understanding Strategies	-.04	-.09	-.10	.09	.07	-.04	-.02	-.08
Factor2: Paralinguistic and Grouping Strategies	.10	.14	.11	.02	-.07	.00	.10	.01
Factor3: Knowledge and Experience-based Strategies	.10	.03	.10	.08	.01	.02	.07	-.05
Factor4: Learning Strategies	-.08	-.233*	-.236*	.01	-.03	.10	-.04	-.04
Task 3 (Short length/Easy)								
	Seek	Start-Stop	Back	Forward	Between	Change SPD	Complete	Score
Factor1: Global Understanding Strategies	.09	-.04	.04	.09	.12	-.02	-.06	.00
Factor2: Paralinguistic and Grouping Strategies	-.06	.02	.02	.11	.01	.223*	.04	.223*
Factor3: Knowledge and Experience-based Strategies	.07	-.06	.10	.05	.17	.11	-.07	.06
Factor4: Learning Strategies	.04	-.05	-.02	.09	.01	.02	-.07	.06
Task 4 (Very long/Difficult)								
	Seek	Start-Stop	Back	Forward	Between	Change SPD	Complete	Score
Factor1: Global Understanding Strategies	.13	-.07	-.10	.14	.12	-.16	.03	.00
Factor2: Paralinguistic and Grouping Strategies	-.02	.10	.04	.13	.03	.16	.15	.25*
Factor3: Knowledge and Experience-based Strategies	.00	-.10	-.04	.04	.05	-.05	-.03	.01
Factor4: Learning Strategies	.07	-.21	-.17	.07	.05	-.06	.00	-.10

Note. *: $r > .02$

The result is not an optimistic one, since it is clear that the number of items showing a correlation is small, and their effect sizes are also rather small. However, there are some possibilities of correlations between the learning strategies and log data. It makes sense to assume there are other complex mechanisms underlying the learner's factors, and we should include more items that might affect the correlation.

4. Conclusions and Pedagogical Implications

This study attempted to explore the possibility of a correlation between learning strategies and log data in dictation training courseware. Starting with a review of the importance of dictation tasks and listening strategies, the need to relate pedagogical constructs with learning analytics was stressed. However, the results obtained here are not clear. The finding in the above table that there is a weak negative correlation between start/stop frequency and learning strategies is interesting. The behavior of repetition could reflect compensation for the weakness of top-down processes, in accordance with previous studies by Field (1999) and other researchers. Longitudinal studies including more psychosocial factors are necessary for future research, to promote LA-based adaptive/personalized learning models along the lines of Xie, Chu, Hwang, and Wang (2019).

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Appendix. List of Question Items for Listening Strategies in this Study

- 1 I pay attention to the main points of the conversation in English to get a general understanding of what is said.
 - 2 I listen to the other person's speech to determine if he/she has understood me correctly.
 - 3 I guess the meaning of unknown words or expressions by noticing redundant words or phrases with similar meaning.
 - 4 I guess the meaning of unknown words by noticing the speaker's tone of voice.
 - 5 I guess the meaning of unknown words by noticing the gestures, actions, or facial expressions of the speaker.
 - 6 I guess the speaker's attitude toward the topic of discussion by noticing redundant words or phrases with similar meaning.
 - 7 I guess the speaker's intentions by noticing the gestures, actions, or facial expressions of the speaker.
 - 8 I judge how well I was able to understand the other person's speech.
 - 9 I pay attention when the speaker communicates new or important information by noticing the intonation or stress on words.
 - 10 I use personal experience to understand the speaker's meaning and intentions.
 - 11 I use my knowledge of the world to understand the speaker's meaning and intentions.
 - 12 I use my knowledge learned from school to understand the speaker's meaning and intentions.
 - 13 I pay attention to English words or expressions that are similar to Japanese words or expressions.
 - 14 I figure out the relationship between events when listening to a passage.
 - 15 When listening to texts, I use the title to guess the content or main idea of what I will hear.
 - 16 When studying outside of class, I pay attention to my feelings about the listening passage.
 - 17 When studying outside of class, I make sure to choose listening passages/materials that I like.
 - 18 When listening to a difficult passage outside of class, I group words and expressions together based on common features.
 - 19 When listening to a passage in class, I pay attention to my feelings about the passage.
 - 20 When conversing in English, I identify chunks of words, or phrases, rather than single words that the other person says.
 - 21 When listening to a difficult passage, I identify chunks of words, or phrases, rather than single words.
 - 22 I mentally prepare to listen by reviewing what I know and don't know about the topic.
 - 23 I use knowledge of English stress and intonation to help me figure out words spoken unclearly.
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