

Investigating Language Learning Strategies in English Conversation Using Non-hierarchical Cluster Analysis

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This paper on language learner strategies utilizes a little used quantitative, datamining technique called cluster analysis to investigate characteristics of groups of South Korean learners of English. After 71 students in three first-year university liberal arts English conversation courses completed the Strategy Inventory for Language Learning (SILL), and the number of learning strategies was reduced from 50 to 26 based on standard deviation (SD) results, the non-hierarchical (K-means) 3-cluster procedure was applied to the self-reported data. Following statistical analysis, each of the three cluster groups could be profiled according to achievement scores. At this point, six items emerged as particularly meaningful with regard to the latter, including direct strategies (a memory one and a cognitive one) and indirect strategies (two affective and two metacognitive). These strategies and their significance with reference to the local context as well as results previously reported in the literature are discussed. Finally, limitations of the study and implications for future research using cluster analysis are reported.

Keywords: language learning strategies, non-hierarchical cluster analysis, conversation classes

1. INTRODUCTION

Scholars have been studying language learning strategies for more than 40 years (Grenfell

& Macaro, 2007). Chamot (2005) describes the evolution from abundant descriptive research in the 1980s and 1990s, followed by a period of stagnation then reinvigoration. Consistently over time, one of the major goals has been to understand learners' effectiveness and to help them become better, self-regulated learners.

A number of qualitative, quantitative, and mixed methods have been employed to study language learning strategies. One less frequently used in the area of second language (L2) research is a quantitative method of data analysis known as cluster analysis that groups participants according to similar traits.

The present study aspires to contribute to research in the field by using this datamining technique. In particular, it makes use of a non-hierarchical clustering method called the K-means algorithm to study 71 students' responses to a language learning strategy inventory (Oxford, 1990) administered in a first-year English conversation course at a South Korean university. Moreover, it examines obtained groupings in relation to their achievement.

The specific aim of this study is to use non-hierarchical cluster analysis to determine groupings of learners with meaningful and previously-unknown common characteristics. The main hypothesis here is that an analysis of the distinguishing traits of groups established through the K-means algorithm using students' reported behaviors on the strategy inventory and their achievement results will allow researchers to discover patterns in strategy use that could in turn be used to assist learners to perform better.

In the first section of this paper, relevant literature related to learning strategies and cluster analysis is briefly reviewed. Next, the study method is presented. In the third section, the quantitative results of the non-hierarchical cluster analysis are revealed. They are discussed in the fourth section and interpreted with reference to the local context and results previously reported in the literature. Finally, implications of this study, limitations, and future directions for research are presented.

2. LITERATURE REVIEW

This section outlines the key points of this study, namely language learning strategies and cluster analysis. It then lightly discusses preexisting literature and the contribution of this work. This leads to a presentation of the current objective and aims, research questions, and hypothesis.

2.1. Language Learning Strategies

In 1990, Oxford published *Language Learning Strategies: What every teacher should know*. Especially since then, ample research has been done internationally on language learning strategies (e.g. Cohen, 2007; Ellis, 1994; Grenfell & Macaro, 2007; Macaro, 2006;

Oxford, 2011), and propelling critiques have been voiced (e.g. Dörnyei, 2005; Grenfell & Macaro, 2007; Ellis, 1994; Macaro, 2006).

There is a fair lack of consensus over the definition of learning strategies (Cohen, 2007; Dörnyei, 2005; Ellis, 1994; Macaro, 2006). Yet, Oxford's (1990) original definition is sufficient for the present purposes. According to her, language learning strategies are "actions taken by second and foreign language learners¹ to control and improve their own learning" (p. ix), "tools for active, self-directed involvement, which is essential for developing communicative competence" (p. 1), and "specific actions taken by the learner to make learning easier, faster, more enjoyable, more self-directed, more effective, and more transferrable to new situations" (p. 8).

Oxford's (1990) Strategy Inventory for Language Learning (SILL) is one of the most commonly employed instruments used to study language learning strategies (Chamot, 2005; Grenfell & Macaro, 2007; Oxford & Burry-Stock, 1995). Version 7.0 (ESL/EFL) of her questionnaire, oriented to adult learners, consists of 50 strategies classified as direct and indirect, depending on whether or not they involved manipulation of language. The first group comprises nine memory (storage and retrieval), fourteen cognitive (comprehension and production), and six compensation (overcoming knowledge gaps) strategies, while the second group includes nine metacognitive (coordination of the learning process), six affective (managing emotions, motivation, and attitudes), and six social (collaborative learning) strategies.

In addition to being widely used for a broad range of applications and with many cultural groups, there is ample evidence that the SILL's content and (both predictive and concurrent) criterion-related validity is strong, although findings for construct validity are weaker (Oxford & Burry-Stock, 1995). The proven utility, reliability, and validity of the SILL are the basis for its use in this study.

Research on the use of language learning strategies of South Korean learners has taken place since the 1990s, but relevant studies are not numerous. In Park's (1997) exploration of language learning strategies from the SILL and English proficiency in South Korean university students, he finds that metacognitive, compensation, and memory strategies are the most frequently used and affective strategies the least; however, cognitive and social strategies are the most predictive of achievement. Citing an earlier study by Park (1994), Oxford and Burry-Stock (1995) note that in addition to cognitive and social strategies;

¹ For the sake of simplicity, 'English as a Second Language' (ESL) basically refers to the language spoken by learners in a country that was once colonized by the English, while 'English as a Foreign Language' (EFL) refers to that typically spoken by learners in a country never colonized. Both terms are contrasted with 'English as a Native Language' (ENL), sometimes called mother tongue use, and 'English as a Lingua Franca' (ELF), which is used for intercultural communication (Jenkins, 2015).

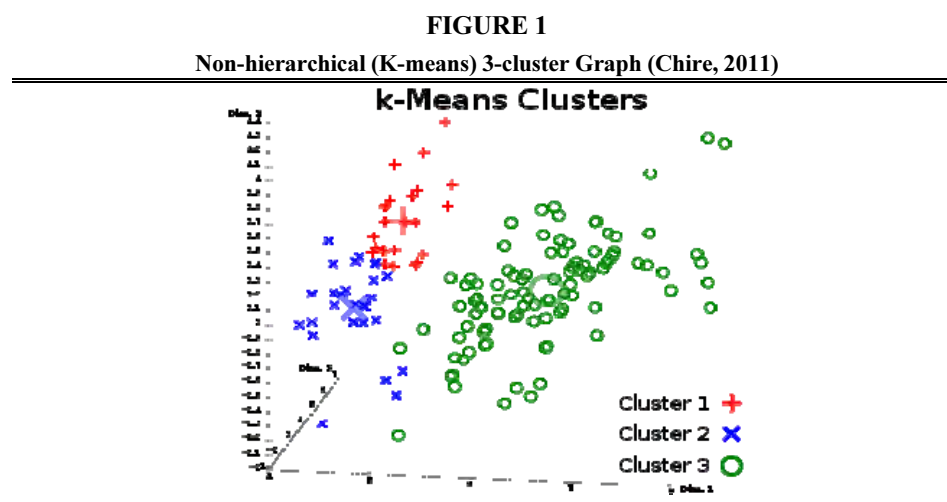
metacognitive ones had a high relationship to the TOEFL test scores of South Korean university students.

2.2. Cluster Analysis

Cluster analysis is an advanced statistical procedure originating in psychology in 1939 and used in many scientific fields today, but not much in education (Battaglia, Di Paola, & Fazio, 2016). Evidently, few L2 studies seem to have made use of cluster analysis (Dörnyei, Csizér, & Németh, 2006).

According to Dörnyei (2007), this type of exploratory analysis is useful for identifying clusters, that is, homogenous groups “of participants within a given sample who share similar combinations of characteristics” (p. 237). By implication, heterogeneous groups should display different combinations of characteristics, which are not established in advance. Clusters are determined by mathematical algorithms.

There are two types of cluster analysis: hierarchical and non-hierarchical (Battaglia et al., 2016; Dörnyei, 2007). Non-hierarchical (K-means) cluster analysis, which is more suitable for investigating larger data sets (Dörnyei, 2007), was used in this study. Taking questionnaire responses as input (Battaglia et al., 2016), this method uses an iterative partitioning process to group participants into a predefined number of clusters (Dörnyei, 2007). Each cluster is represented by a centroid, which pinpoints the average behavior of its participants (Battaglia et al., 2016). Figure 1 offers a two-dimensional projection of a three-dimensional visual of a hypothetical set of data after application of a non-hierarchical (K-means) 3-cluster procedure.



All research involves a degree of subjectivity. In cluster analysis, predefining the number of clusters during the decision-making process is an example, and Dörnyei (2007) cautions that the validity of this approach can be called into question as a result. Similarly, Battaglia et al. (2016) note that this method does not

require a-priori assumptions about the data[. However, it does] need actions and decisions to be taken before, during and after analysis. The selection of variables, the choice of the criteria of similarity between the data, the choice of clustering techniques, the selection of the number of groups to be obtained and the evaluation of the solution found, as well as the choice between possible alternative solutions, are particularly important. [... D]ifferent choices can lead to separate, and somehow arbitrary, results (as they heavily depend on the criteria used for the selection of the data) (pp. 1-2).

Section 3.4 describes the method used to overcome this weakness.

2.3. Studies on Language Learning Strategies Using Cluster Analysis

In L2 research a handful of studies making use of this datamining technique have been found. Some have focused on language aptitude based on memory or analysis-orientation (Skehan, 1986), cognitive profiles (Rysiewicz, 2008); social models of learning and teaching (Alexander & Murphy, 1999), vocabulary (Ahmed, 1989; Gu & Johnson, 1996; Kojic-Sabo, 1997; Kojic-Sabo & Lightbown, 1999; Ma, 2014; Uchikoshi & Marinova-Todd, 2012), writing (Friginal, Li, & Weigle, 2014; Jarvis, Grant, Bikowski, & Ferris, 2003), learning strategies, willingness to learn, and achievement (Yamamori, Isoda, Hiromori, & Oxford, 2003), affect, motivation, and language learning strategies (Woodrow, 2006), and fluency (Götz, 2013).

Yet, few of the above-cited studies focus specifically on language learning strategies. Those that do (e.g. Yamamori et al., 2003) make minimal use of strategies, focusing on only a few items. From the outset, this study examines students' reported use of a greater number of strategies. Finally, a unique point of this research is that it begins to fill a gap: no studies on language learning strategies using cluster analysis appear to have been done on South Korean university students.

2.4. Purpose of the Current Study

The objective of this study is to discover groupings of students with meaningful and previously unknown common characteristics using non-hierarchical cluster analysis. Then, on the basis of emerging classifications, this study aims to determine 1) if/how strategy use

is related to with achievement; and 2) what strategies are used differently between clusters of students. Thus, the following specific research questions are: 1) Do groupings reflect differences in achievement? and 2) Do we discover meaningful patterns in strategy use according to the clusters? The main hypothesis here is that an analysis of the distinguishing traits of groups established through the K-means algorithm using students' reported behaviors on the SILL and their achievement results will allow researchers to discover tendencies in strategy use that could in turn be used to assist learners to perform better.

3. RESEARCH METHOD

This section describes the participants, local educational context, instruments, and procedures followed in this exploratory, cross-sectional study of learning strategies.

3.1. Participants

The sample in this study consisted of 71 learners placed in compulsory English Conversation 1 (CEFR level: A1-A2²) courses for first-year students at a national university in South Korea. In total, there were three classes: one English major (n = 25) and two mixed major (n = 46). The same 'native-speaking' teacher taught all three classes.

3.2. Language Education and the Language Program

Before attending university, South Korean students usually receive seven years of obligatory English classes (~476 hours) through formal education (UNESCO-IBE, 2011) and take a College Scholastic Ability Test (CSAT), emphasizing reading and listening comprehension. To graduate from the university in question, they are required to complete two courses of conversational English (worth four credits). Prior to this study, the participants had successfully passed a placement test to qualify for entry into English Conversation 1.

3.3. Instruments and Method of Data Collection

One instrument was used to collect data from students. It was a bilingual (Korean-

² CEFR refers to the Common European Framework of Reference for Languages, an internationally recognized guide providing descriptors of learner achievements at six proficiency levels from A1 (beginner) to C2 (mastery).

English) SILL Questionnaire completed in class. However, the 50-item self-report questionnaire was modified to include minor reformulations of a few of the closed-ended (5-point Likert Scale) questions to better suit the contemporary English as a Lingua Franca context. Together with this, final course scores (as evidence of achievement) were collected from the teacher for comparison. Relative scores were calculated by summing participation in class (20%), extra listening and conversation practice outside of class (15%), weekly online assignments (20%), pair speaking tests (20%), and a final listening and language test (25%). SILL data and final course scores were compiled in a Microsoft Excel spreadsheet.

3.4. Method of Data Analysis

Cluster analysis was chosen as the method of analysis for this study in order to focus on cases (learners) rather than variables (learning strategies and achievement). Due to the constraint of analyzing too many items/strategies at once (Dörnyei, 2007), for the purposes of this study, 26 items, as it happens almost proportional in number with strategies in each of the six categories (i.e. memory, cognitive, compensation, metacognitive, affective, and social) of the SILL, were retained for further analysis. (See Appendix.) These were considered meaningful because they happened to have a standard deviation above the threshold of one ($SD > 1$)³.

After, the non-hierarchical (K-means) 3-cluster procedure, using IBM SPSS Statistics Version 23 software, was applied to the data. As predetermining the number of clusters is considered a weakness of non-hierarchical analyses (Battaglia et al., 2016; Dörnyei, 2007), the silhouette value⁴, as a method of determining consistency, was used to establish the natural number of clusters for analysis. After examining the average silhouette values for two, three, four, and five clusters, the largest average value occurred in the case of three clusters, hence the decision to perform a 3-cluster analysis. Subsequently, strategy use

³ Results showing a low standard deviation ($SD < 1$) indicate too great a degree of similarity, which makes it difficult to classify them into meaningful clusters. For this reason, these were eliminated from the study.

⁴ $s(i)$, the silhouette value for a learner i in our study, is defined as follows:

$$s(i) = \frac{b(i) - a(i)}{\max\{a(i), b(i)\}}$$

In this equation, $a(i)$ is the average distance of all learners from i within the same cluster, and $b(i)$ is the lowest average distance of all learners in other clusters from i . After subtracting $a(i)$ from $b(i)$, the total is divided by the larger average distance, either $a(i)$ or $b(i)$, resulting in a silhouette value ranging from -1 to +1. A high silhouette value (close to one) indicates greater homogeneity (i.e. fit) with data in its own cluster and, at the same time, greater dissimilarity with data in other clusters, signaling appropriate classification.

was examined for differences with consideration of achievement. This is discussed in the next section.

4. RESULTS AND ANALYSIS

This section provides description in an attempt to characterize the differences between the three emergent clusters (C1, C2, and C3).

4.1. Cluster Size

In terms of the number of participants in each group, two clusters (C1 and C2) were almost similar and accounted for 80% of the sample as shown in Table 1. C3 was about half the size.

TABLE 1

Size of Each Cluster

Clusters Size	C1	C2	C3	Total
Number	30	27	14	71
Percent	42%	38%	20%	100%

4.2. Achievement

As for achievement, as Table 2 indicates, C2, with an average achievement score of 85%, is the strongest group, and C3, at 76%, is the weakest. While there is only a slight difference in scores between C1 and C2, the difference between C2 and C3 is almost ten points and a full letter grade. Moreover, each group's score corresponds with a different grade according to the relative grading system at the university.

TABLE 2

Average Achievement of Each Cluster

Clusters Achievement	C1	C2	C3
Average score	82%	85%	76%
Average grade	B	B+	C+

4.3. Distinguishing Strategies

With regard to the experimental results, six strategies appear to be meaningful in differentiating cluster groups. These include numbers 8, 10, 14, 23, 24, and 26 in the

Appendix. According to Oxford's (1990) classification, two are direct strategies, including a memory strategy:

- 1) I use flashcards to remember new English words. (S1) and a cognitive strategy:
- 2) I practice the sounds of English. (S2) Four are indirect strategies, including two affective strategies:
- 3) I encourage myself to speak English when I am afraid of making mistakes. (S3)
- 4) I try to relax whenever I feel anxious about using English. (S4) and two metacognitive strategies:
- 5) I try to find out how to be a better learner of English. (S5)
- 6) I plan my schedule, so I have enough time to study English. (S6)

4.4. Overall Strategy Use

In terms of overall strategy use, Table 3 shows that certain items were used more often than others. The numbers in the columns indicate the centroid, or the ideal representative response for each cluster. Higher scores reflect greater reported strategy use (1 = never or almost never true of me; 5 = always or almost always true of me). Thus, notably, the two metacognitive strategies (S5 and S6) and the affective strategy (S4) were used most frequently, whereas the memory strategy (S1) was used the least frequently overall.

TABLE 3
Centroids of Strategies in Each Cluster

Clusters Strategies	C1	C2	C3
S1	2	3	1
S2	3	4	2
S3	3	4	2
S4	4	4	2
S5	4	4	2
S6	4	4	2

4.5. Differential Strategy Use

With regard to strategy use, the groups can also be characterized differently. The following reported results correspond with Table 3 above. Relatively speaking, C2 used the memory (S1) and cognitive (S2) strategies more than the other clusters. C3 used both the least. C3 also used the affective strategies (S3 and S4) less than the other two clusters. Relatively speaking, C1 uses memory (S1), cognitive (S2), and affective (S3) strategies less than C2 but more than C3. C3 used the metacognitive strategies (S5 and S6)

substantially less than the other two clusters. Finally, the results for C1 and C2 are comparably high for affective (S4) and metacognitive (S5 and S6) strategies.

4.6. Cluster Profiles

The above results enable the clusters to be characterized as shown in Figure 2. Three profiles result: low achievement – low strategy use for C3, medium achievement – medium strategy use for C1, and high achievement – high strategy use in the case of C2. In each case, the descriptive title was chosen to reflect the general tendency of the group.

FIGURE 4

Summary of Learning Profiles for Each Cluster

Clusters	Profiles
C2	High Achievement – High Strategy Use
	Medium Memory
	High Cognitive
	High Affective
	High Metacognitive
C1	Medium Achievement – Medium Strategy Use
	Low Memory
	Medium Cognitive
	Medium Affective
	High Metacognitive
C3	Low Achievement – Low Strategy Use
	Low Memory
	Low Cognitive
	Low Affective
	Low Metacognitive

5. DISCUSSION

Yamamori et al. (2003) point out that “strategies are always used in a particular context and [...] contextual differences are likely to influence strategy use” (p. 383). English language competence is highly valued in South Korea (Park, 2009), yet learners respond differently to this reality. Starting with the direct strategies, followed immediately by the indirect ones, this section discusses ways in which behavior is reflected in reported use in connection with the local context.

5.1. Memory Strategy: I Use Flashcards to Remember New English Words (S1)

Given the prevailing test-taking culture in South Korea, learners tend to invest a lot of time and energy into learning vocabulary. Using effective strategies to memorize words and expressions is likely to yield returns on high-stakes tests, such as the Test of English for International Communication (TOEIC), the Test of English as a Foreign Language (TOEFL), and the International English Language Testing System (IELTS).

Flashcard use, while considered decontextualized and rather unfashionable, has proven to be not only efficient but also very effective (Nation, 2001). Nevertheless, it was not expected to be meaningful among South Korean university students as experience in the cultural context points to flashcards rarely being used after elementary school, and research has shown the strategy to be unpopular (Griffiths, 2003; Lee, 2007).

In fact, although not highly rated, the difference in flashcard use between higher and lower achievement groups was meaningful as shown previously in Table 3. This may reflect differences in attitudes towards the importance of language learning. Additionally, the role of technology in South Korea, one of the most connected countries in the world (OECD, 2017), might offer insight. Certain learners may take greater advantage of digital flashcard applications (e.g. Memrise and Quizlet).

5.2. Cognitive Strategy: I Practice the Sounds of English (S2)

Despite the fact that a focus on ‘correct’ pronunciation has declined in importance in many places due to research in applied linguistics (e.g. on English as an International Language and Global Englishes) and a shift from ‘native speaker’ accuracy to intelligibility (Jenkins, 2015; McKay, 2002), it is still considered important in South Korea today.

In fact, many scholars note the hegemony of English, and the importance of, especially American, pronunciation (Park, 2009). Despite debate over the issue, many South Koreans still consider ‘native speakers’ to be the best models and teachers of English (Redmond, 2016).

With regard to pronunciation, according to one university study (Kim & Kim, 2016), South Korean learners feel especially anxious about segmental features. The above reasons may explain why different groups of learners in this study reported spending more or less time practicing the sounds of English.

5.3. Two Affective Strategies: I Try to Relax Whenever I Feel Anxious about Using English (S3) and I Encourage Myself to Speak English When I am Afraid of Making Mistakes (S4)

McCroskey and Richmond (e.g. 1987) have shown that anxiety is a barrier to ‘willingness

to communicate' which can influence learners' engagement in communicative activities. Similarly, anxiety is known to affect self-confidence, which can prevent learners from engaging in learning activities that lead to higher proficiency (Dörnyei & Schmidt, 2001).

South Korean university students do not only feel anxiety over pronunciation. Other types are also felt. For example, comparative anxiety is one important type documented in relation to South Korean language learners (Basco & Han, 2016; Han, 2015; Kim, 2004).

However, some learners feel more anxiety than others. Research on South Korean university students tends to show a correlation between anxiety and performance. Basco and Han (2016) report that students at the advanced level (as well as those with a higher CSAT score) had higher self-esteem and motivation and lower anxiety, whereas students at the basic level had relatively lower self-esteem and motivation and higher anxiety. Previously, Han (2015) reported similar results with anxiety decreasing as proficiency level increases.

Similarly, the differential use of affective strategies by groups of learners in this study appears to reflect proficiency levels, with higher level students coping better with anxiety by trying to relax whenever they feel anxious about using English and encouraging themselves to speak English even when they are afraid of making mistakes. This is also in line with Griffiths (2003) finding that more advanced learners often used these strategies.

5.4. Two Metacognitive Strategies: I Try to Find out How to be a Better Learner of English (S5) and I Plan my Schedule, so I Have Enough Time to Study English (S6)

One study showed that South Korean learners used metacognitive strategies more frequently than other categories of strategies (Park, 1997). More specifically, in her comparative study of learners, Griffiths (2003) observed that South Korean learners declared being more proactive than learners from other countries in Asia and Europe when it came to improving their ways of studying. They also reported scheduling in study time more often overall. As far as achievement is concerned, as previously reported, Park (1994) observes a correlation between the use of metacognitive strategies and proficiency.

Results of the cluster analysis show that metacognitive strategies are commonly used among stronger proficiency groups. Differences in the reported use between lower and higher achieving groups may also reflect attitudes towards language learning.

6. CONCLUSION

6.1. Summary

The aim of this study was to see how the quantitative, datamining technique known as cluster analysis would group learners with meaningful patterns of language learning strategies. In this particular study, thanks to the non-hierarchical (K-means) 3-cluster procedure, it was possible to differentiate three profiles of South Korean university students in English conversation classes, whose strategy use varied with respect to achievement: high achievement – high strategy use, medium achievement – medium strategy use, and low achievement – low strategy use. Moreover, six particular distinguishing strategies, namely a memory strategy, a cognitive strategy, two affective strategies, and two metacognitive strategies, emerged as meaningful with regard to the local context and previous research.

6.2. Limitations

Of course, this study has certain limitations. As this was a quantitative study, a larger sample would have been ideal for better representation. In addition, a more objective achievement score (e.g. a standardized test score rather than final course scores) could have been sought as a variable. Finally, as has been noted, nonhierarchical cluster analysis has a few weak points, one being the inherent subjectivity of the method. Thus, the findings of this study may have been different, for example, if the study had been conducted on classes with a different skill focus (e.g. writing rather than conversation).

6.3. Future Directions

Research on language learning strategies continues to be important to improve teaching and learning outcomes. Further exploratory research using cluster analysis, and especially the non-hierarchical method or a combination of hierarchical and non-hierarchical methods, with different samples in different learning contexts may contribute to a greater understanding of their use in the future.

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APPENDIX

Learning Strategies Used in This Study

No.	Strategy	Category	<i>M</i>	<i>SD</i>
1	I remember new English words or phrases by remembering where I saw them, for example, their location on a page, on a board or on a website.	Mem	2.36	1.20
2	I first read over an English passage quickly then go back and read it carefully.	Cog	2.75	1.20
3	I make up new words when I do not know the right ones in English.	Comp	3.01	1.18
4	I watch English TV shows and movies.	Cog	2.85	1.17
5	I try not to translate word-for-word.	Cog	3.03	1.14
6	When I can't think of English words during conversation, I use gestures.	Comp	3.72	1.13
7	I look for opportunities to read as much as possible in English.	Met	2.92	1.12

8	I practice the sounds of English.	Cog	3.40	1.12
9	I physically act out new English words.	Mem	2.19	1.12
10	I plan my schedule, so I have enough time to study English.	Met	3.39	1.12
11	I ask people to correct my errors.	Soc	2.96	1.12
12	I use rhymes to remember new English words.	Mem	2.65	1.12
13	I ask others for help with English.	Soc	3.21	1.11
14	I try to find out how to be a better learner of English.	Met	3.94	1.10
15	I talk to other people about how I feel when learning English.	Aff	2.43	1.10
16	I read English without looking up every new word.	Comp	2.75	1.10
17	I say or write new English words several times.	Cog	3.29	1.08
18	I try to find patterns in English.	Cog	2.63	1.07
19	I try to learn about the cultures of diverse English speakers.	Soc	3.53	1.06
20	I look for similarities between Korean and English.	Cog	2.56	1.06
21	I give myself rewards or treats when I do well in English.	Aff	2.11	1.06
22	I have clear goals for improving my English skills.	Met	4.04	1.05
23	I encourage myself to speak English even when I am afraid of making mistakes.	Aff	3.08	1.02
24	I use flashcards to remember new English words.	Mem	2.04	1.01
25	I practice English with other people.	Soc	2.64	1.01
26	I try to relax whenever I feel anxious about using English.	Aff	3.40	1.00

Note. In the first column, No. is short for number. The six strategy categories in column three are abbreviated as follows: memory (Mem), cognitive (Cog), compensation (Comp), metacognitive (Met), affective (Aff), and social (Soc). In the following columns, *M* indicates the mean score and *SD*, the standard deviation.

Applicable levels: Tertiary

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