International Journal of Computer Information Systems and Industrial Management Applications
ISSN 2150-7988 Volume 18 (2026) pp. 1-11

https://doi.org/10.70917/ijcisim-2026-0059
Article

The Interaction between Cognitive Style and Vocabulary Outputability of ESL Learners Based on Learning Behavioral Data

Baiqiu Liao *

Leshan Normal University, Leshan 614000, Sichuan, China; lbqlanguage@outlook.com

Abstract: This study conducted an empirical study of the interactive relationship between cognitive style and vocabulary outputability of ESL learners based on the learning behavior data of 40 students from a MOOC platform. The data were obtained and analyzed through MongoDB, in which their learning behaviors were classified into field-independent and field-dependent cognitive styles, each with 20 students. Based on the research framework in this paper, the former includes expansion of resource clicks and interlecture exercises, while the latter includes courseware video clicks and student discussion behavior. As vocabulary output metrics were unavailable, the output values were derived through vocabulary output scale tests in terms of vocabulary quantity, vocabulary depth, vocabulary use precision, and vocabulary use automation degree. Based on the collected data, an empirical analysis of Pearson correlation coefficient values revealed significant positive correlations between ESL learners' vocabulary outputability and their learning behavioral factors related to field-independent or field-dependent cognitive styles. The result indicates that differentiated teaching should be adopted to improve lexical teaching efficiency for ESL learners of different cognitive styles.

Keywords: cognitive style; vocabulary output; behavioral data; Pearson's correlation coefficient

1. Introduction

Foreign language teaching has begun to acknowledge that second language learning is inherently influenced by numerous factors, with particular attention being paid to learners' intrinsic factors such as their age, cognitive style, learning motivation, personality traits, and so on [1-2]. Among cognitive styles, field dependence and field independence have been the earliest areas of study. Field-dependent individuals are more inclined to obtain the information they need through interaction with others, while field-independent individuals prefer to immerse themselves in their own world, maintaining clear boundaries with the outside world. They have a high degree of autonomy in accepting external information, and these differences manifest in learning and teaching, influencing students' academic performance [3-5]. The cognitive style integration theory combines different style models, such as field cognition and cautious-impulsive style models, into two independent cognitive style dimensions: holistic-analytical and verbal-imagery style dimensions [6-7]. The verbal-imagery style dimension describes an individual's preference for processing information through language or images. For example, when both types of learners hear a word, verbal-style learners automatically visualize the word itself, while imagery-style learners unconsciously visualize the corresponding image of the word [8-10]. In other words, verbal-style learners prefer to think about information they see, hear, or read in verbal form. Imagery-style learners, on the other hand, prefer to represent information in visual form. Furthermore, this theory posits that there is no superiority or inferiority between these two modes of representation, but learners perform better when using their preferred mode of representation [11].

Language learning is a self-developing process, an accumulation of all previous states, and the nonlinear, self-adaptive nature of the language system is composed of different systems [12]. As

language learners progress in their learning process and accumulate language learning experience, the language learning system constructs language meaning across multiple levels of vocabulary, grammar, and sentences, thereby generating a new language learning system. Vocabulary, as the most important foundation of the language learning system, plays an undeniable role in language meaning construction [13-15]. Among these, Nation divides vocabulary into productive vocabulary and receptive vocabulary [16]. Productive vocabulary refers to vocabulary that language learners can freely produce without external interference, such as in writing and daily communication. The more receptive the vocabulary learners acquire, the smaller their ability to use vocabulary. The more productive the vocabulary learners acquire, the greater their ability to use vocabulary [17]. It is evident that the process of vocabulary acquisition is a transformation from passive vocabulary to active vocabulary. This is a dynamic process that reflects learners' control over the vocabulary they have already learned [18].

Cognitive style is one of the important factors influencing individual differences among students, and effective presentation methods are key to facilitating second language vocabulary learning. Literature [19] found a significant positive correlation between learners' cognitive styles and language proficiency (writing and speaking), but this correlation is very small. Literature [20] revealed that field-independent learners can unconsciously achieve better vocabulary acquisition in written and oral output compared to field-dependent learners; field-dependent learners are more likely to achieve high vocabulary acquisition effects in written output, while field-independent learners are more suited to oral output. Literature [21] demonstrates that field-independent learners exhibit superior short-term vocabulary memory performance in mobile-assisted vocabulary acquisition compared to field-dependent learners. Literature [22] explores the interplay between vocabulary learning strategies, vocabulary knowledge, and cognitive styles, finding that cognitive style negatively influences vocabulary indirect learning strategies, with field-dependent learners exerting an intermediary effect on vocabulary knowledge among high-achieving learners through indirect learning strategies. Literature [23] points out that in task-based language teaching, time planning and cognitive style interact and influence language production outcomes, with field-dependent learners performing slightly worse than field-independent learners. Meanwhile, the group embedded figures test in Literature [24] shows that field-dependent learners exhibit better performance than field-independent learners in terms of vocabulary production and receptivity, with significant differences in vocabulary production performance.

Since the MOOC platform stores the learning behavior data of each student, it is proposed to use MongoDB database to collect the learning behavior data of 40 students from the student learning behavior data file of the MOOC platform, which can be classified into four types of learning behaviors. Considering that the vocabulary output value is subjective, the quantitative value of vocabulary output of second language learners of English is collected by means of a scale test, and then the Pearson's correlation coefficient is used to design a research program on the interaction between cognitive style and vocabulary output of second language learners of English. The obtained research data were imported into SPSS software for correlation validation analysis, and based on the analysis results, it was confirmed that the interaction between the two had an important role to play in enhancing the vocabulary output of second language learners.

2. Mechanisms of Learners' Cognitive Style and Vocabulary Outputability

2.1. Student Behavior Data

The MOOC platform records the learning behavior data of each student, this paper uses MongoDB database to extract the learning behavior data of 40 students from the MOOC platform student learning behavior data file, and imports the valid data into SPSS for summary statistics.

2.1.1. Classroom Video Hits

Table 1 counts the video viewing data in the MOOC platform of students numbered 40, and the video viewing data of all students are summarized and counted as shown in Table 2. Figure 1 shows the relationship between the total length of students' video viewing and students' vocabulary achievement, from which it can be seen that students' vocabulary achievement is proportional to the total length of video viewing, the average of students' achievement for the total length of video viewing is less than 500 minutes is 61.67 points, and the average of students' achievement for the total length of video viewing is more than 1,300 minutes is 99.2 points, which is a very big gap and the longer the length of video viewing, the higher the students' achievement. The longer the video viewing time, the higher the students' scores. Figure 2 shows the relationship between the number of video views and the students' vocabulary scores. From the figure, it can be seen that the number of video views and the students' vocabulary scores are positively proportional to each other, and the average score of the students who have less than 150 views is 60.6, while the average score of the students who have more than 450 views

is more than 99.5, which is a big difference in the scores. It is concluded that the total video viewing time and the number of video clicks are important indicators that affect students' vocabulary learning effectiveness.

Table 1. Statistics of students' video viewing data.

Learner		Login date	The start time of the video	The end time of the video	Viewing duration
Effective practice	Video 1	2023.9.23	20:06:30	20:08:35	00:01:55
	Video 2	2023.9.23	20:11:02	20:13:12	00:01:10
	Video 3	2023.9.25	20:15:50	20:26:12	00:10:22
	Video 4	2023.9.25	11:30:26	11:36:00	00:05:34
	Video 5	2023.9.25	11:36:28	11:39:05	00:02:37
	Video 6	2023.9.28	12:40:02	10:42:39	00:02:37

Table 2. Summary of students' video viewing data.

N	Total number of video clicks	The video is available for viewing duration	Student grades	N	Total number of video clicks	The video is available for viewing duration	Student grades
1	104	415	60	21	336	787	83
2	115	443	60	22	339	804	84
3	119	445	60	23	343	807	84
4	129	457	60	24	350	819	88
5	149	482	63	25	358	824	89
6	167	489	67	26	390	927	89
7	175	520	67	27	396	967	90
8	178	520	69	28	397	1038	91
9	182	522	70	29	402	1043	92
10	182	552	71	30	402	1048	93
11	202	583	73	31	428	1078	95
12	208	596	74	32	428	1168	95
13	210	610	74	33	430	1180	95
14	212	655	75	34	445	1193	97
15	218	681	78	35	446	1244	98
16	234	690	78	36	447	1351	98
17	270	702	80	37	454	1422	99
18	281	714	81	38	463	1437	99
19	307	724	83	39	466	1442	100
20	326	769	83	40	497	1483	100

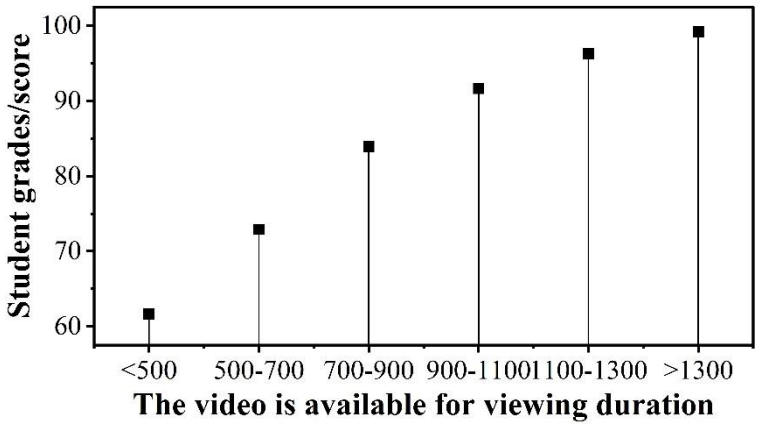

Figure 1. The relationship between duration and students' final grades.

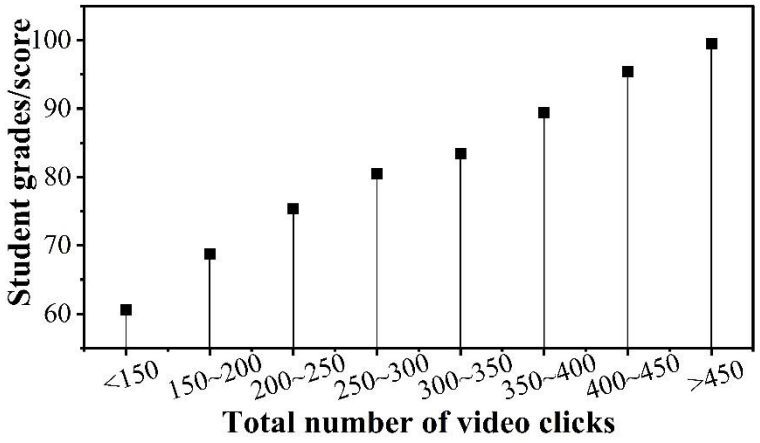

Figure 2. The relationship between click-through rate and students' final grades.

2.1.2. Expanding Resource Hits

The data about students' behavior of expanding resources obtained from the MOOC platform are shown in Table 3. The relationship between the number of clicks on expansion resources and vocabulary scores is statistically shown in Figure 3, from which it can be seen that with the increase of clicks on expansion resources, vocabulary scores do not increase substantially, so the number of clicks on expansion resources can influence students' learning results, but it is not an important influence factor.

Table 3. The click-through rate of students' extension resources.

Learner		Login date	Login start time
Effective resources	1	2023.9.21	10:10:24
	2	2023.9.23	11:15:24
	3	2023.9.24	10:28:50
	4	2023.9.24	10:55:26
	5	2023.9.27	11:26:36
	6	2023.9.27	10:46:02

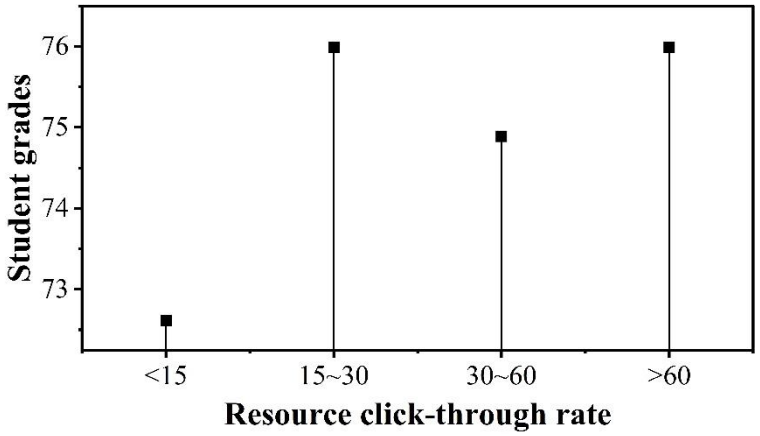

Figure 3. Resource click-through rate and students' graduation grades.

2.1.3. Inter-Lecture Exercises

Each lecture video provides students with practice questions, students can only answer 3 times without counting the score, and the data obtained are shown in Table 4. In this paper, we extracted the students' average scores of the 3 inter-lecture exercises from the MOOC platform and analyzed and compared them with the vocabulary scores as shown in Fig. 4, and it can be seen that the average scores of the inter-lecture exercises do not have much effect on the vocabulary scores.

Table 4. Students' inter-lecture practice data acquisition.

Learner		Login date	Start time of practice	Practice end time	Score
Effective practice	1	2023.9.21	10:10:30	10:12:05	96
	2	2023.9.21	10:14:02	10:16:48	82
	3	2023.9.21	10:26:50	10:30:18	92
	4	2023.9.21	10:50:26	10:51:56	71
	5	2023.9.21	10:52:28	10:53:47	94
	6	2023.9.21	10:54:00	10:55:02	98

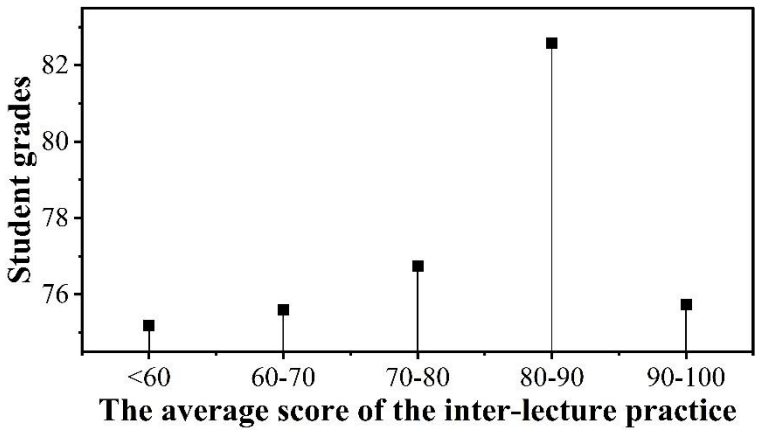

Figure 4. The relationship between the number of practices and the final grade.

2.1.4. Data on Student Learning Behavior in Discussion Forums

Discussion forum is an important function in the MOOC platform of Teachers' University Hall. Discussion forums are divided into classes, with S (student posting area) and T (teacher posting area) under each class, and students are free to post in the S area of their own class but can only reply to the posts in the T area. Teacher posting area usually has five types of posts, student check-in post, student question post, teaching guidance post, teacher tutoring post and homework display post. Student sign-in post is mainly used for teachers to classroom students' attendance statistics, student question post students can ask questions freely, teachers and students for students to give timely responses to the questions raised. Teaching guide posting in which teachers need to provide knowledge or questions that can guide students to participate in learning activities. Teacher counseling posts provide teachers with detailed explanations of the key points of the course and guidance. Homework display post to provide students with a platform for homework display, students through the homework display can see the work of others, conducive to learning from each other, to find their own deficiencies.

2.2. Research Program Design

2.2.1. Definition of Cognitive Style

Cognitive style, also known as cognitive manner or cognitive mode, describes the way an individual is interested in processing information, as well as the functional patterns exhibited by the individual's perceptual thinking process [25-26]. Cognitive style theory reveals that learners differ at the cognitive level and can be divided into three main categories that classify different types of cognitive styles: cognitive-centered, personality-centered, and behavior-centered.

(1) A cognitively-based approach to category classification is used with the aim of emphasizing the uniqueness that characterizes students' learning styles. Common types include: field-dependent, field-independent, contemplative, and impulsive.

(2) Types centered on personality traits explored the styles of recognizing personality traits and the impact on personality traits. Based on this, they are categorized into four types: intuitive, perceptual, thinking, and emotional. In categorizing them, they can be divided into extroverted intuitive type, extroverted emotional type, intrinsic intuitive type and intrinsic emotional type. The energy consumption model describes the uniqueness of cognitive styles in both temporal and spatial dimensions. In the temporal dimension, it describes a structure consisting of order and disorder. In the spatial dimension, the cognitive modality describes the way humans acquire and disseminate information, which can be categorized into two types: a concrete type and an abstract type. According to the classification of space

and time, we can categorize several forms such as concrete-ordered, concrete-random, abstract-ordered, and abstract-random.

(3) Behavior-focused taxonomy reflects the ever-deepening way of knowing. It incorporates different educational strategies, for example, students' learning styles and educational styles. Learning style is an approach to learning that students prefer to adopt, and it can be categorized as convergent, divergent, and conformist. Teaching style refers to a variety of educational styles and approaches adopted by teachers in educational activities, which can be mainly categorized as task-based, early childhood and professional. The current research conducted on them can be broadly categorized into field-dependent and field-independent, thinking and impulsive, and aggregative and divergent types, which belong to the category of holistic-analytical dimensions. Abstract and concrete thinking, speech and image belong to the category of verbal phenomena, while the research on "field independence" and "field dependence" is a hotspot for scholars at home and abroad.

2.2.2. Research Questions

Field-dependent/field-independent cognitive styles have a wide range of effects on lexical productiveness, and it is crucial to explore the relationship between them. The author expects to finally find out the relationship between students' field-independent/field-dependent cognitive styles and vocabulary outputability by answering the following three research questions, with a view to understanding how students' cognitive styles affect vocabulary outputability, and thus attempting to give some corresponding insights into English teaching to help students find a better English learning method suitable for themselves.

(1) What are the characteristics of the distribution of students' cognitive styles?

(2) Is there any correlation between field-independent/field-dependent cognitive styles and vocabulary outputability (vocabulary size, vocabulary depth, vocabulary use precision, vocabulary use automatization) and how?

2.2.3. Research Subjects

In this study, 40 students majoring in English at College A were selected as the respondents, 20 male and 20 female. The research subjects were selected from the grade level where the author's research team is deeply involved, which facilitated the development of the study, the test of cognitive style and the collection of vocabulary outputability.

Before conducting the test of cognitive styles, the author surveyed the students' basic information including: name, gender, age and student behavior data (described above). The age of the respondents ranged from 18-20 years old, of which 5 boys and 5 girls were 18 years old. 10 boys and 10 girls were 19 years old. 5 boys and 5 girls were 20 years old. According to the survey, most of the students started learning English from the third grade of elementary school, and a few of them were exposed to English from kindergarten.

2.2.4. Research Instruments

(1) Acquisition of Student Cognitive Style Behavior Data

Through the above analysis of student cognitive style behavior data of second language learners, it is known that the student cognitive style behavior consists of four parts: classroom video clicks, expansion resources clicks, inter-session practice, and student discussion behavior, and the MOOC platform records each student's learning behavior data, and in consideration of the redundancy of the data, this paper uses the MongoDB database to randomly extract the learning behavior data of 40 students from the student learning behavior data files of the MOOC platform. The learning behavior data of 40 students were randomly extracted as the students' cognitive style behavior data for this study, which provides solid data theoretical support for the following research work, and also ensures the validity of the research results so that they are more in line with the actual situation of English second language learners.

(2) Vocabulary Output Test Scale

Based on the relevant References and data, the Vocabulary Output Test Scale was designed, which consists of four dimensions (vocabulary quantity, vocabulary depth, vocabulary use precision, vocabulary use automation), with 10 items for each dimension, and a total of 40 items in all, which, after repeated pre-testing, reflects the excellent reliability and validity performance of the scale.

(3) Interviews

The final research instrument in this study is the interview, where the questions set corresponding open-ended questions based on the content investigated to further substantiate the findings. The questions included feelings about vocabulary learning, the amount of vocabulary, depth of vocabulary, precision of vocabulary use, degree of automation of vocabulary use, and what they found most difficult

in vocabulary learning.

(4) Mathematical and statistical methods

This study used the statistical software SPSS24 at the end of October 2023 to statistically analyze the behavioral data on the cognitive styles of the input testers and their vocabulary outputability (vocabulary size, vocabulary depth, vocabulary use accuracy, vocabulary use automation level) data. The overall situation of students' cognitive style behavioral data was counted, and then the cognitive style behavioral data were correlated with vocabulary output, which was analyzed in order to find out whether there is any correlation between cognitive style and vocabulary output, and to analyze the relationship between cognitive style and gender and vocabulary output.

3. Analysis of Empirical Studies

3.1. Descriptive Statistical Analysis

3.1.1. Student Behavior Data for Cognitive Style

The study was based on the cognitive style behavioral data of the subjects, and in this study, the students who scored more than or equal to 80 points on the cognitive style behavioral data were categorized as field-independent learners, however, those who scored less than 80 points were categorized as field-dependent learners. The cognitive style student behavioral data are shown in Table 5, where the classroom video clicks, extended resource clicks, interlecture exercises, and student discussion behaviors are named X1, X2, X3, and X4, respectively. According to the data in Table 5, it is shown that among the 40 subjects, the students' cognitive style learning behaviors scored the highest score of 100, and the lowest score of 60, which is a large gap. It is also known that among the 40 students, there are 20 field-independent learners, including expansion of resource clicks X2 (80.23±3.627) and interlecture exercises X3 (84.75±4.863), which account for 50.00%. There are 20 field-dependent learners, including courseware video clicks X1 (68.44±5.241), student discussion behavior X4 (71.63±3.992), accounting for 50.00%. This indicates that the cognitive styles of students in higher education can be categorized into field-independent and field-dependent, and that the number of students in field-independent and field-dependent is the same (both 50.00%). Thus, students have their own cognitive style characteristics and personality traits, and teachers should take students' cognitive styles into full consideration in teaching and adopt appropriate teaching strategies and teaching methods for students with different cognitive styles according to their abilities. At the same time, teachers should help students to recognize their own cognitive styles and choose suitable learning methods, which will be more helpful to improve the vocabulary output of L2 learners.

Table 5. Student behavior data of cognitive style.

Type	N	Minimum value	Maximum value	Mean value	Standard deviation
X1	7	60	100	68.44	5.241
X2	8	60	100	80.23	3.627
X3	12	60	100	84.75	4.863
X4	13	60	100	71.63	3.992

3.1.2. Descriptive Statistical Analysis of Vocabulary Outputability

With the help of the above scale test, the quantitative values of vocabulary outputability of the research subjects were obtained and the quantitative values of vocabulary outputability were analyzed by descriptive statistics, and the results of the descriptive statistical analysis of vocabulary outputability are shown in Table 6, in which Y1, Y2, Y3, Y4 represent vocabulary quantity, vocabulary depth, vocabulary use precision, and vocabulary use automation degree, respectively. The data size in the table shows that the minimum value of the quantitative value of vocabulary productiveness dimension is 1, and the corresponding maximum value is 5, which is in line with the standard requirements of the scale test. The mean values of vocabulary size Y1, vocabulary depth Y2, vocabulary use accuracy Y3, and vocabulary use automation degree Y4 can also be derived, which are 3.27, 3.48, 3.19, 3.35, respectively, and the corresponding standard deviations are 0.29, 0.43, 0.51, and 0.38, respectively, which can be further summarized that the vocabulary depth Y2 (3.48) > vocabulary use automation degree Y4 (3.35) > vocabulary size Y1 (3.27) > vocabulary use accuracy Y3 (3.19), and the mean values of all dimensions of vocabulary outputability are above 3, which indicates that the second language learners have good vocabulary outputability, and it provides data support for the following inquiry into the interaction between cognitive styles and vocabulary outputability of ESL learners.

Table 6. Descriptive statistical analysis results of lexical output.

Type	N	Minimum value	Maximum value	Mean value	Standard deviation
Y1	40	1	5	3.27	0.29
Y2	40	1	5	3.48	0.43
Y3	40	1	5	3.19	0.51
Y4	40	1	5	3.35	0.38

3.2. Correlation Analysis

3.2.1. Field-Independent Cognitive Styles and Lexical Output Correlations

On the basis of known field-independent cognitive style of second language learners' behavioral data and the quantitative value of lexical outputability, using Pearson correlation coefficient in the mathematical statistics method, the field-independent cognitive style and lexical outputability correlation is investigated, as the field-independent cognitive style of second language learners' behavioral data includes the amount of clicks on the expansion resources X2, inter-speaking exercises X3, the results of the correlation analysis are shown in Tables 7~8. Among them, Table 7 shows the results of the correlation analysis between the number of clicks on expansion resources X2 and lexical outputability Y, and Table 8 shows the results of the correlation analysis between inter-speaker exercises X3 and Y lexical outputability. Combining Table 7 and Table 8 shows that Expanded Resource Clicks X2, Inter Lecture Exercise X3 and Y vocabulary outputivity have significant positive correlation, and their Pearson correlation coefficients are positive and satisfy Sig<0.05, which confirms the correlation between field-independent cognitive styles and vocabulary outputivity.

Table 7. Correlation analysis results (X2 and Y).

Symbol		X2	Y1	Y2	Y3	Y4
X2	Pearson	1	0.333	0.121	0.376	0.235
	Sig		0.004	0.003	0.005	0.005
	N	8	8	8	8	8
Y1	Pearson	0.333	1	0.307	0.356	0.285
	Sig	0.004		0.006	0.007	0.002
	N	40	40	40	40	40
Y2	Pearson	0.121	0.307	1	0.325	0.113
	Sig	0.003	0.006		0.009	0.002
	N	40	40	40	40	40
Y3	Pearson	0.376	0.356	0.325	1	0.206
	Sig	0.005	0.007	0.009		0.003
	N	40	40	40	40	40
Y4	Pearson	0.235	0.285	0.113	0.206	1
	Sig	0.005	0.002	0.002	0.003	
	N	40	40	40	40	40

Table 8. Correlation analysis results (X3 and Y)

Symbol		X3	Y1	Y2	Y3	Y4
X3	Pearson	1	0.137	0.315	0.436	0.248
	Sig		0.009	0.008	0.002	0.002
	N	12	12	12	12	12
Y1	Pearson	0.137	1	0.681	0.297	0.578
	Sig	0.009		0.003	0.009	0.005
	N	40	40	40	40	40
Y2	Pearson	0.315	0.681	1	0.414	0.485
	Sig	0.008	0.003		0.004	0.003
	N	40	40	40	40	40
Y3	Pearson	0.436	0.297	0.414	1	0.639
	Sig	0.002	0.009	0.004		0.008
	N	40	40	40	40	40
Y4	Pearson	0.248	0.578	0.485	0.639	1
	Sig	0.002	0.005	0.003	0.008	
	N	40	40	40	40	40

3.2.2. Field-Dependent Cognitive Styles and Lexical Output Correlations

The behavioral data analysis of the cognitive styles of second language learners shows that the classroom video clicks X1 and student discussions X4 belong to the field-dependent cognitive style. With the theoretical support of Pearson's correlation coefficient, this subsection will explore the field-dependent cognitive style and lexical output correlation from these two aspects, and the results of the correlation analysis are shown in Tables 9 to 10, where Table 9 shows the results of the correlation analysis between video clicks X1 and lexical output Y, and Table 10 shows the results of the correlation analysis between student discussion X4 and lexical output Y. Based on the data performance in the table, it can be seen that frequency clicks X1, student discussion X4 all show significant positive correlation with lexical output, Pearson correlation coefficient are greater than 0, less than 0.7, and satisfy the condition of Sig < 0.05 significance judgment, which is a good interpretation of the correlation between field-dependent cognitive style and lexical output.

Table 9. Correlation analysis results (X1 and Y).

Symbol		X1	Y1	Y2	Y3	Y4
X1	Pearson	1	0.449	0.596	0.659	0.293
	Sig		0.002	0.006	0.004	0.001
	N	7	7	7	7	7
Y1	Pearson	0.449	1	0.284	0.185	0.665
	Sig	0.002		0.003	0.009	0.008
	N	40	40	40	40	40
Y2	Pearson	0.596	0.284	1	0.475	0.385
	Sig	0.006	0.003		0.006	0.001
	N	40	40	40	40	40
Y3	Pearson	0.659	0.185	0.475	1	0.596
	Sig	0.004	0.009	0.006		0.009
	N	40	40	40	40	40
Y4	Pearson	0.293	0.665	0.385	0.596	1
	Sig	0.001	0.008	0.001	0.009	
	N	40	40	40	40	40

Table 10. Correlation analysis results (X4 and Y).

Symbol		X4	Y1	Y2	Y3	Y4
X4	Pearson	1	0.483	0.327	0.473	0.274
	Sig		0.007	0.007	0.008	0.004
	N	13	13	13	13	13
Y1	Pearson	0.483	1	0.392	0.506	0.625
	Sig	0.007		0.002	0.005	0.004
	N	40	40	40	40	40

Y2	Pearson	0.327	0.392	1	0.309	0.674
	Sig	0.007	0.002		0.009	0.005
	N	40	40	40	40	40
Y3	Pearson	0.473	0.506	0.309	1	0.221
	Sig	0.008	0.005	0.009		0.007
	N	40	40	40	40	40
Y4	Pearson	0.274	0.625	0.674	0.221	1
	Sig	0.004	0.004	0.005	0.007	
	N	40	40	40	40	40

4. Conclusion

This paper first obtains the behavioral data of learners' cognitive styles and the quantitative values of vocabulary outputability with the help of student interview and MOOC platforms, respectively, and confirms the interactive relationship between the cognitive styles of English second language learners and lexical productiveness through Pearson correlation analysis.

(1) It is known that there is a significant positive correlation between the number of clicks on extended resources X2, inter-speaker exercises X3 and Y vocabulary outputability, and the Pearson correlation coefficient values are distributed in the range of 0.1~0.7, and the corresponding Sig values are less than 0.05, which verifies the interactive relationship between field-independent cognitive styles of the second language learners and vocabulary outputability.

(2) It is found that video clicks X1 and student discussions X4 have significant positive correlations with vocabulary outputability, with Pearson correlation coefficient values in the range of [0~0.7], and Sig values of the dimensions are less than 0.05, which highlights the interactive relationship between field-dependent cognitive styles and vocabulary outputability of second language learners.

Acknowledgements

1. Fund program: The Influence of Learners' Cognitive Styles on Processing of Second Language Productive Vocabulary (Grant No. 2024DYA01) supported by Leshan Multilingual Cognitive Development and Education Popularization Base. 2. Fund program: Fusion Innovation in English Applied Linguistics (Grant No. JXTD-2023-7) supported by Teaching Team Construction Projects of Leshan Normal University. 3. Fund program: On the Optimized Scheme of Cultivating Innovative Abilities of English Majors with Top-notch Talent Development (Grant No. JG2023-XW-04) supported by New Liberal Arts Projects of Leshan Normal University.

References

1. Birdsong, D. (2018). Plasticity, variability and age in second language acquisition and bilingualism. Frontiers in psychology, 9, 81.
2. Ngadjen, S. A. (2023). Internal and External Factors Affecting Children's Second Language Acquisition. HUELE: Journal of Applied Linguistics, Literature and Culture, 3(2), 100-107.
3. Saracho, O. N. (2020). The role of field dependent/independent styles in learning and teaching. In Oxford Research Encyclopedia of Education.
4. Sudirman, S., Son, A. L., Rosyadi, R., & Fitriani, R. N. (2020). Uncovering the Students' mathematical concept understanding ability: a based study of both students' cognitive styles dependent and independent field in overcoming the problem of 3D Geometry. Formatif: Jurnal Ilmiah Pendidikan MIPA, 10(1).
5. Samuel, M. N., & Orluwene, D. G. W. (2019). Influence of field dependent-independent cognitive style on students' academic achievement in English language in junior secondary schools in rivers state. differences (Pitcher, 2002, Riding & Douglas (1993), 19, 23.
6. Lacko, D., Prošek, T., Čeněk, J., Helísková, M., Ugwitz, P., Svoboda, V., ... & Šašinka, Č. (2023). Analytic and holistic cognitive style as a set of independent manifests: Evidence from a validation study of six measurement instruments. Plos one, 18(6), e0287057.
7. Höffler, T. N., Koć-Januchta, M., & Leutner, D. (2017). More evidence for three types of cognitive style: Validating the object-spatial imagery and verbal questionnaire using eye tracking when learning with texts and pictures. Applied cognitive psychology, 31(1), 109-115.
8. Burak, D., & Gültekin, M. (2021). Verbal-Visual Learning Styles Scale: Developing a Scale for Primary School Students. International Journal on Social and Education Sciences, 3(2), 287-303.
9. Koć-Januchta, M., Höffler, T., Thoma, G. B., Prechtl, H., & Leutner, D. (2017). Visualizers versus verbalizers: Effects of cognitive style on learning with texts and pictures–An eye-tracking study. Computers in human behavior, 68, 170-179.
10. Kurniawan, C., Setyosari, P., Kamdi, W., & Ulfa, S. (2023). Verbalizer-visualizer preferences of engineering students: Validity and reliability. Psychology, Evaluation, and Technology in Educational Research, 6(1), 83-95.
11. Shemy, N. S. (2021). The effectiveness of interactive e-books in the development of scientific concepts during"

science course" and its relation to the difference of cognitive style (verbal/visual) in students. European Journal of Open Education and E-Learning Studies, 6(1).
12. Arnold, J., & Brown, H. D. (2018, November). Affect in language learning: A map of the terrain. In Language learning and emotions: Third international conference on language education and testing (pp. 1-25).
13. Masitoh, S., Pratama, R. T., & Aryana, S. (2025). The Role of Vocabulary and Grammar in Indonesian Language Learning at Schools. JLER (Journal of Language Education Research), 8(2), 113-127.
14. De la Garza, B., & Harris, R. J. (2017). Acquiring foreign language vocabulary through meaningful linguistic context: Where is the limit to vocabulary learning?. Journal of Psycholinguistic Research, 46, 395-413.
15. Robiya, H., Feruzabonu, M., & O‘g‘ilxon, M. (2024). The Role of Vocabulary in Learning Language. Western European Journal of Linguistics and Education, 2(5), 344-347.
16. Zhong, H. F. (2018). The relationship between receptive and productive vocabulary knowledge: A perspective from vocabulary use in sentence writing. The Language Learning Journal, 46(4), 357-370.
17. Uchihara, T., & Saito, K. (2019). Exploring the relationship between productive vocabulary knowledge and second language oral ability. The language learning Journal, 47(1), 64-75.
18. Elcin, D., & Sahinkarakas, S. (2021). Self-Regulatory Capacity of Learners' with Differing Proficiency Levels in Vocabulary Acquisition during Three Periods. Shanlax International Journal of Education, 9, 162-197.
19. Hamzah, A. N., & Baa, S. (2022). The Relationship between Cognitive Styles and English Productive Skills of Vocational High School Students in Makassar. IDEAS: Journal on English Language Teaching and Learning, Linguistics and Literature, 10(1), 525-537.
20. Xiaoxiao, L., & Sijia, X. (2020). The Effect of Cognitive Style on Non-English Majors’ Incidental Vocabulary Acquisition through Reading. INNOVATION AND MANAGEMENT, 804.
21. Mehdipour-Kolour, D., & Ali, M. B. (2024). Examining the effects of two cognitive styles (field dependence vs. field independence) on learners’ mobile-assisted vocabulary acquisition. Journal of China Computer-Assisted Language Learning, 4(2), 225-246.
22. Satori, M. (2024). Exploring the Complex Associations among Language Proficiency, Aptitude, Cognitive Style, Vocabulary Learning Strategies, and Vocabulary Knowledge. The Journal of AsiaTEFL, 21(3), 586-599.
23. Gui, J., & Ismail, S. M. (2024). The effect of planning time on vocabulary acquisition in a task-based environment: The mediating roles of working memory and field (in) dependence. BMC psychology, 12(1), 145.
24. Heidari, K. (2022). A Psycholinguistic Look at the Role of Field Dependence/Independence in Receptive/Productive Vocabulary Knowledge: Does it Draw a Line?. Journal of Psycholinguistic Research, 51(6), 1393-1408.
25. Yuan Tian,Liangyu Bai,Jingyi Bai,Ke Chen,Zhenhao Liu & Chao Wang. (2024). A Study on the Relationship between Field Cognitive Style and English Reading Strategy Choice. English Language Teaching,17(11),113-113.
26. Thu Thuy Tran Thi,Mai Hoa Nguyen Thi & Ngoc Nguyen Dao Thi. (2024). Cognitive Styles and Influences on Academic Writing: An Empirical Investigation among English Language Learners. English Language Teaching,17(10),46-46.