

# Vocabulary background knowledge, working memory capacity, and reading comprehension among Chinese ESL students

Peng, Yu ✉

Graduate School, Lyceum of the Philippines University - Batangas, Philippines

Received: 25 April 2024  
Available Online: 15 July 2024

Revised: 25 June 2024  
DOI: 10.5861/ijrsl.2024.026

Accepted: 10 July 2024

ISSN: 2243-7754  
Online ISSN: 2243-7762

OPEN ACCESS



## *Abstract*

In response to growing concerns about the effectiveness of online education, this study explores the interplay between vocabulary background knowledge, working memory capacity, and reading comprehension among Chinese English as a Second Language (ESL) students. Four hundred (400) participants from various ESL programs in China were selected. It was found that Chinese ESL students demonstrate a moderate level of vocabulary background knowledge, working memory capacity, and reading comprehension. T-test results indicate gender differences in the three variables, with females exhibiting superior performance in vocabulary background knowledge, working memory capacity, and reading comprehension. Additionally, the study identifies significant differences between students majoring in liberal arts and science, with liberal arts students surpassing their counterparts in vocabulary background knowledge and working memory capacity. A highly significant relationship among vocabulary background knowledge, working memory capacity, and reading comprehension was found. Students exhibiting greater proficiency in vocabulary background knowledge and working memory capacity are inclined to achieve higher levels of reading comprehension. Building on these findings, the study recommends the implementation of tailored enhancement programs to fortify Chinese ESL students' language skills in an online learning context. and advocates for the establishment of a conducive online classroom environment. Moreover, it emphasizes the integration of explicit training on vocabulary acquisition, working memory enhancement, and reading comprehension strategies into regular ESL teaching.

**Keywords:** Chinese ESL students, vocabulary background, working memory, reading comprehension, language skills

## **Vocabulary background knowledge, working memory capacity, and reading comprehension among Chinese ESL students**

### **1. Introduction**

The acquisition of a second language, particularly English, by Chinese ESL (English as a Second Language) students, presents a fascinating interplay of cognitive and linguistic elements. Central to this process is the role of vocabulary background knowledge, working memory capacity, and reading comprehension. Vocabulary knowledge is not only foundational to language acquisition but also a critical indicator of academic success in a second language. It is intricately linked with working memory capacity, which plays a pivotal role in how new words are learned and retained. Moreover, reading comprehension, a complex cognitive task, is significantly influenced by both the depth of vocabulary knowledge and the capacity of working memory. This is particularly relevant in the context of Chinese ESL learners, who often face unique challenges due to the significant differences between the Chinese and English languages. The interdependencies of these elements underscore the importance of a multifaceted approach to understanding and enhancing the language learning process for ESL students. This dissertation aims to explore these relationships, offering insights into how vocabulary background knowledge and working memory capacity collectively impact reading comprehension among Chinese ESL learners.

In an era marked by unprecedented global interconnectedness, the acquisition of a second language has garnered paramount significance, enabling individuals, societies, and economies to transcend linguistic barriers and engage in multifaceted interactions (Earle et al., 2020). Proficiency in a second language, particularly English, has emerged as a transformative tool, facilitating cross-cultural exchanges, international business ventures, and access to a vast repository of knowledge across diverse domains (Segaran et al., 2021). Within the intricate landscape of language acquisition, the complex interplay between vocabulary background knowledge, working memory capacity, and reading comprehension skills profoundly shapes learners' linguistic competence and communicative effectiveness (Bosch et al., 2014).

The importance of this study lies in its focus on the critical elements of language acquisition: vocabulary knowledge, working memory capacity, and reading comprehension, particularly among Chinese students learning English as a Second Language (ESL). This exploration is crucial as it addresses the unique challenges and cognitive dynamics faced by this demographic in mastering English (Gao et al., 2023; Teng, et al., 2022). The acquisition and mastery of an extensive vocabulary are fundamental to effective language use. Vocabulary is not just a collection of words but a dynamic network of interconnected lexical units crucial for language proficiency. For Chinese ESL students, the journey to acquire English vocabulary is marked by challenges stemming from significant linguistic differences between Chinese and English, such as morphological distinctions and syntactic variations (Yang et al., 2023). Understanding these challenges is vital for developing effective vocabulary acquisition strategies that resonate with the Chinese linguistic framework. Working memory plays a critical role in language processing and comprehension, acting as a cognitive workspace for managing linguistic information. For Chinese ESL students, transitioning from their native language to English requires cognitive flexibility, heavily taxing their working memory (Tan, 2014).

This study aims to understand how working memory capacity influences their ability to absorb new vocabulary, comprehend sentence structures, and infer meanings in a second language context. Reading comprehension in ESL learners is a complex skill that arises from the interplay between vocabulary knowledge and working memory capacity. It involves decoding words, constructing meaning, and connecting new information with existing knowledge. For Chinese ESL students, reading English texts presents additional challenges, such as understanding culturally specific references and idiomatic expressions. This study seeks to dissect these complexities to enhance reading comprehension strategies for these learners. Recent research highlights the importance of metacognitive strategies in language learning, involving the awareness and regulation of one's learning processes. Integrating

these strategies with vocabulary learning and working memory management could significantly improve reading comprehension in Chinese ESL students. Moreover, technology-driven language learning tools offer innovative methods for vocabulary expansion and reading engagement, which this study will explore. The findings of this study have significant implications for both theory and practice in second language acquisition. They contribute to a deeper understanding of the interconnected processes of vocabulary acquisition, working memory, and reading comprehension. For educators and curriculum designers, these insights are invaluable for developing targeted instructional strategies and interventions that cater to the specific needs of Chinese ESL students.

In the following sections, this paper will delve into a comprehensive review of recent literature on these topics, with a focus on the experiences of Chinese ESL students. By synthesizing current research, the study aims to shed light on the complex interplay of these factors, enhancing our understanding of second language acquisition processes. The insights gained will guide educators, curriculum designers, and researchers in developing more effective language instruction practices tailored to the unique challenges faced by Chinese ESL students in their English language journey. This study embarks on an exploration of the symbiotic relationship between vocabulary background knowledge, working memory capacity, and reading comprehension skills among Chinese students immersing themselves in mastering English as a Second Language (ESL). In the context of a rapidly evolving global landscape, China's burgeoning economy and its growing global role underscore the pivotal importance of English proficiency for active participation in the international arena. English proficiency transcends linguistic competence, encompassing sociocultural adaptability, cognitive acumen, and academic excellence. Against this backdrop, a comprehensive examination of the intricate dynamics between vocabulary, working memory, and reading comprehension becomes essential for devising effective language learning strategies.

**Objectives of the Study** - The purpose of this study is to determine vocabulary background knowledge, working memory capacity, and reading comprehension among Chinese English as a Second Language (ESL) to propose an intervention program to contribute to the understanding of language learning processes and pedagogical implications for ESL instruction. Specifically, this described the profile of the respondents in terms of sex, age, English proficiency level and year level; determined the respondents' vocabulary background knowledge in terms of vocabulary size, word recognition skills, and lexical diversity; identified the respondents' working memory capacity in terms of processing and retaining information, making connections within a text, and allocating and managing working memory resources; Assessed the respondents' reading comprehension in terms of understanding main ideas, identifying key details, making inferences, drawing conclusions, and analyzing information critically; tested the differences in responses when grouped according to profile variable; tested the relationship between vocabulary background knowledge, working memory capacity, and reading comprehension; and proposed an intervention program to contribute to the understanding of language learning processes and pedagogical implications for ESL instruction.

## 2. Methods

**Research Design** - This study mainly focused on descriptive quantitative analysis methods combined with questionnaires and mathematical statistics. Descriptive statistics relate to data that have been evaluated to show the key characteristics of data gathered or used in a study. The fundamental goal of the descriptive correlational study is to characterize the variables and the logical connections between and among them. It is a well-liked research instrument that enables researchers to gather and explain the characteristics of the demographic segment (Kaya & İşler Dalgıç, 2021; Kathryn & Eva Marie, 2014). This study adopted this method to describe vocabulary background knowledge, working memory capacity, and reading comprehension among Chinese ESL students and to investigate the correlation among the three variables.

**Participants of the Study** - The 400 student participants in the survey were all from seven departments of Bohai University which is the university I work in. Bohai University is a provincial key comprehensive undergraduate university located in Liaoning Province, China. They were selected by random sampling. The main survey objects were freshmen, sophomores, juniors, and senior. The students were about 20-22 years old and began

to learn English at the age of 8, that is they began to learn English in the third grade of primary school. The participants major in different disciplines, and participate in online questionnaire survey. They have studied English-related courses in college, such as grammar, reading, listening, speaking and writing.

**Data Gathering Instrument** - The questionnaire of this study consists of four parts: Questionnaire A, B, C and D. Questionnaire A is on the background information of the survey participants, including gender, age, English proficiency level and academic year. Questionnaire B is designed according to the previous questionnaire. This part has 30 statement items in the form of five Likert scales. The third questionnaire is adapted from Working Memory and Mathematical Problem Solving in Children at Risk and Not at Risk for Serious Math Difficulties, which consists of 15 issues concerning learners' working memory capacity. To compare the anxiety degree of different dimensions, the author used the average form for the total score and the score of different dimensions. The last one is a questionnaire about reading comprehension, which is adapted from Teaching and Researching Reading. New York: Routledge. Grabe, and Stoller, F (2019). The questionnaire consists of three components of reading comprehension, including understanding main ideas component, identifying key details component, making inferences component, drawing conclusions component, and analyzing information critically component. It is divided into 25 statements, and its validity and reliability are tested.

Indicators	Cronbach's Alpha	Remarks
Vocabulary Size	0.953	Excellent
Word Recognition Skills	0.954	Excellent
Lexical Diversity	0.951	Excellent
Processing and Retaining Information	0.912	Excellent
Making Connections within a Text	0.904	Excellent
Allocating and Managing Working Memory Resources	0.927	Excellent
Understanding Main Ideas	0.926	Excellent
Identifying Key Details	0.904	Excellent
Making Inferences	0.908	Excellent
Drawing Conclusions	0.914	Excellent
Analyzing Information Critically	0.901	Excellent

In accordance with George and Mallery's (2003) guidelines, all Cronbach Alpha values surpass the threshold for excellence, reinforcing the reliability of the study's measurement instruments and the consistency in capturing the targeted cognitive constructs.

**Data Gathering Procedure** - This study first adopted the method of questionnaire to collect the subjects' views on vocabulary background knowledge, working memory capacity, and reading comprehension among Chinese ESL students and then carried out data analysis. The data were collected through a questionnaire. The reasons for choosing the questionnaire survey method include empirical research needs to make statistics on the situation of the respondents; data collected through this method is easier to quantify and analyze; this method will give participants enough time to provide accurate and correct answers; and the method has the advantages of low cost and time-saving. Under the guidance of a certain theoretical framework and related research, this study has determined three research variables of vocabulary background knowledge, working memory capacity, and reading comprehension among Chinese ESL students.

By reviewing the literature related to the three research variables, describing the students' vocabulary background knowledge, working memory capacity, and reading comprehension profiles, the current status of these three variables in Chinese universities has been determined, and the theoretical model of the research has been constructed. Through the measurement of three variables, the research method of quantitative analysis was adopted to determine the connection between the three. Finally, relevant theories were applied to conduct an in-depth discussion and analysis of the research results. First, teachers sent questionnaires to students through WeChat groups of various majors, grades and classes. Then, the students were asked to read the explanation carefully before answering the questions. After filling out the demographic information questionnaire truthfully, the students began to complete the subscales. To analyze the data Statistical Package for the Social Science (SPSS) was used.

**Ethical Considerations** - The university English instructors and students under investigation have the right to know the purpose of the experiment. Investigators should pass on information to ensure that anonymous test papers and questionnaires will remain anonymous throughout the research process. In addition, the experiment was conducted under the supervision of the teaching departments of the schools surveyed. Moreover, the moral permission came from the Research Center of the Lyceum of the Philippines University.

**Data Analysis** - The collected data is presented, analyzed and interpreted by various statistical methods through tables, charts and graphs. Frequency and percentage distributions were used to describe the profile of the respondent. Weighted mean and rank were used to describe and evaluate the vocabulary background knowledge, working memory capacity, and reading comprehension among Chinese English as a Second Language (ESL). The result of the Shapiro-Wilk Test showed that the p-values of all variables were less than 0.05 which means that the data set was not normally distributed. Therefore, Spearman rho was used as part of the non-parametric tests to determine the significant relationship. All analyses were performed using SPSS version 28.

### 3. Results and discussion

**Table 1**

*Vocabulary Background Knowledge*

Indicators	Weighted Mean	Verbal Interpretation	Rank
1. Vocabulary Size	3.31	Agree	3
2. Word Recognition Skills	3.32	Agree	2
3. Lexical Diversity	3.38	Agree	1
Composite Mean	3.34	Agree	

*Legend: 3.50-4.00=Strongly Agree; 2.50-3.49=Agree; 1.50-2.49=Disagree; 1.00-1.49=Strongly Disagree*

Table 1 is the vocabulary background knowledge of the respondents. As consistent with the previously mentioned dimensions, background knowledge is divided into three dimensions, namely vocabulary size, Lexical diversity, and Word Recognition Skills. Respondents agree that they have good overall vocabulary background knowledge. Among the three assessed aspects, lexical diversity has the highest mean (3.38), followed by word recognition skills (3.32), and lastly vocabulary size at 3.31. This suggests respondents are most confident in using a wide range of vocabulary appropriately. This includes specialized, academic, and figurative language. Word recognition capabilities also score well, reflecting the perceived ability to identify meanings of new words from context and expand vocabulary over time. While still decent, comparative vocabulary size ranks slightly lower. This hints at a need to further build breadth and depth in absolute vocabulary knowledge. Respondents' sufficient lexical diversity and word recognition provide a robust framework for advancing vocabulary size and overall knowledge. They seem adept at picking up new lexicons from context and using vibrant language. Instructional efforts could leverage these strengths to incrementally introduce new vocabulary. The layering of academic, specialized and figurative language can occur atop a base of mastery in fundamental vocabulary. As vocabulary size has the largest growth avenue, a volume approach that rapidly builds word banks through reading, listening and explicit memorization can enhance this parameter.

**Table 2**

*Working Memory Capacity*

Indicators	Weighted Mean	Verbal Interpretation	Rank
1. Processing and Retaining Information	3.33	Agree	2
2. Making Connections within a Text	3.32	Agree	3
3. Allocating and Managing Working Memory Resources	3.35	Agree	1
Composite Mean	3.33	Agree	

*Legend: 3.50-4.00=Strongly Agree; 2.50-3.49=Agree; 1.50-2.49=Disagree; 1.00-1.49=Strongly Disagree*

Table 2 shows the respondents' overall self-assessments regarding the three evaluated dimensions of working memory capacity. With a composite mean of 3.33, respondents generally agree that they display competent

memory abilities in handling information processing and manipulation demands in language-based contexts. Among the subsets, the highest category score of 3.35 is seen for effectively allocating working memory assets, including attention regulation and cognitive load balancing across tasks. Slightly lagging at 3.33 is temporarily retaining retrieved details from external interfaces like reading or listening. Making associations between loaded inputs such as concepts within texts ranks last with a still agreeable mean of 3.32.

Collectively, this suggests that participants are most confident in their capability to strategically direct brainpower resources based on situational priorities. This perceived behavioral control aligns with flow experience, characterized by immersive self-directed learning wherein challenges are counterpoised with skills. Working memory regulation plays a key role here as students confront increasing complexity. When effectively leveraged as indicated by the results, fluid dynamics facilitate self-actualized, autonomous mastery. Conversely, gaps exist in participants' transitory retention bandwidths, likely owing to biological memory duration bottlenecks. Consequently, while feeling adept at allocating energies, respondents may occasionally come up short in the storage room needed to fully crystallize the allocated efforts. Much like a CPU smoothly delegating power across computer applications but still encountering lag when RAM space runs out, enhancing memory span through mnemonic techniques can boost overall workload processing.

Together these findings suggest empowering learners to take charge of their mental faculty direction can inspire motivation and engagement – provided sufficient foundational techniques first augment the underlying memory capacities being managed. Achieving this balance enables flow. Students can then fluidly steer their energies across language tasks without overtaxing resources. Instruction in expanding working memory even as executive regulation is nurtured promises to uplift performance.

Table 3 offers an overarching glimpse into respondents' multidimensional reading comprehension proficiencies spanning fundamental theme recognition to complex critical analysis. With composite agreeableness across all facets, individual abilities generally appear decently developed. However, a broader inferential review revealing relative rankings within the hierarchical taxonomy intimates' substantive nuances between convergent and divergent competencies. This stratification highlights an evolutionary trajectory commonly evidenced during analytical skill progression.

**Table 3**

*Reading Comprehension*

Indicators	Weighted Mean	Verbal Interpretation	Rank
1. Understanding Main Ideas	3.27	Agree	4
2. Identifying Key Details	3.29	Agree	3
3. Making Inferences	3.37	Agree	2
4. Drawing Conclusion	3.26	Agree	5
5. Analyzing Information Critically	3.40	Agree	1
Composite Mean	3.32	Agree	

Legend: 3.50-4.00=Strongly Agree;2.50-3.49=Agree;1.50-2.49=Disagree;1.00-1.49=Strongly Disagree

As Ritchhart and Perkins (2022) established in their seminal research on comprehension maturation, lower-order concrete information processing involving identification and application of explicit concepts typically precedes higher-order abstract evaluation involving analysis and creation of implicit perspectives. Most learners demonstrate comfortable competency with the former but tend to hit developmental ceilings without adequate coaching in the latter, often due to insufficient cognitive flexibility or metacognitive orientation at higher tiers of abstraction (Kuhn, 1999).

Accordingly, while respondents evaluate themselves well in fundamental reading faculties like decoding meanings, recalling details and deriving straightforward inferences, capabilities taper off within more subjective domains necessitating contextualization and criticality. Enriching empathy, curiosity and reflexivity through perspective-taking, debate mappings, journaling and epistemic belief mentoring is crucial for nurturing growth towards evaluative wisdom (Myszkowski & Storme, 2020). Such scaffolding to bridge convergent comprehension

into divergent discernment aids the ascent into multilayered critical reading fluency. Lower-level reading abilities provide a springboard for transcending into higher-order dynamism through guided discovery. Coaching this escalation promises to uplift transferable critical faculties for consuming the diverse discourses defining modern literacy.

**Table 4**

*Relationship Between Vocabulary Background Knowledge and Working Memory Capacity*

Vocabulary Size	r-value	p-value	Interpretation
Processing and Retaining Information	.381**	0.000	Highly Significant
Making Connections within a Text	.478**	0.000	Highly Significant
Allocating and Managing Working Memory Resources	.448**	0.000	Highly Significant
<b>Word Recognition Skills</b>			
Processing and Retaining Information	.448**	0.000	Highly Significant
Making Connections within a Text	.427**	0.000	Highly Significant
Allocating and Managing Working Memory Resources	.465**	0.000	Highly Significant
<b>Lexical Diversity</b>			
Processing and Retaining Information	.424**	0.000	Highly Significant
Making Connections within a Text	.448**	0.000	Highly Significant
Allocating and Managing Working Memory Resources	.408**	0.000	Highly Significant

\*Correlation is significant at the 0.05 level /\*\*. Correlation is significant at the 0.01 level

Table 4 details correlational analysis between vocabulary dimensions and working memory aspects, examining their interrelationships and codependence. Strong positive associations emerge across all subset pairings, confirming lexical knowledge - encompassing size, recognition and diversity - as crucial antecedents uplifting core cognitive competencies around processing efficiency, assimilation depth and attentional regulation. Cognitively, vocabulary building represents an accumulation of neural connections linking words to contextual meanings, providing the very schema against which new informational patterns are interpreted (Sweller et al., 2019). In parallel, working memory denotes the transient activation of selective neural paths to temporarily represent and manipulate inputs by tapping into wider associative networks like vocabulary. Their tight coupling is therefore symbiotic and cyclical. Instructionally, these findings advocate vocabulary instruction as a precursor literacy activity equipping the very basic mental models for comprehension and critical thinking. Methodologies like reading immersion, concept mapping, differentiated exposure and multimedia engagement can enrich neural connections to then empower working memory capabilities applied during learning. Simultaneously, mnemonic strategies improve retention to positively reinforce vocabulary uptake. This recursive interplay underscores language grounding before skill extension.

Table 5 mirrors the strong correlations between vocabulary and reading competencies across identification, inference and evaluation - unsurprising given their conceptual overlap at an encoding level. It further demonstrates working memory capacities positively predicting reading skills by enabling input representation, connective assimilation and attentional manipulation. Integrated, the lexicon-memory-reading associations showcase a cascading interdependence hierarchy whereby vocabulary builds neural frameworks for temporary information activation via working memory to manifest comprehension. Reinforcing this scaffolding through phased literacy coaching can thus optimize reading excellence.

Table 6 demonstrates significant positive correlations between facets of working memory and reading comprehension dimensions, confirming a pivotal mediating role for temporary cognitive resource activation in uplifting interpretation capabilities. This substantiates empirical evidence situating the quality and efficiency of knowledge representation for manipulation within working memory as an antecedent determinant of overall analytical appreciation (Jaroslawska et al., 2016).

**Table 5***Relationship Between Vocabulary Background Knowledge and Reading Comprehension*

Vocabulary Size	r-value	p-value	Interpretation
Understanding Main Ideas	.463**	0.000	Highly Significant
Identifying Key Details	.422**	0.000	Highly Significant
Making Inferences	.363**	0.000	Highly Significant
Drawing Conclusion	.406**	0.000	Highly Significant
Analyzing Information Critically	.421**	0.000	Highly Significant
<b>Word Recognition Skills</b>			
Understanding Main Ideas	.480**	0.000	Highly Significant
Identifying Key Details	.440**	0.000	Highly Significant
Making Inferences	.443**	0.000	Highly Significant
Drawing Conclusion	.434**	0.000	Highly Significant
Analyzing Information Critically	.441**	0.000	Highly Significant
<b>Lexical Diversity</b>			
Understanding Main Ideas	.411**	0.000	Highly Significant
Identifying Key Details	.366**	0.000	Highly Significant
Making Inferences	.393**	0.000	Highly Significant
Drawing Conclusion	.453**	0.000	Highly Significant
Analyzing Information Critically	.361**	0.000	Highly Significant

\*Correlation is significant at the 0.05 level /\*\*\*. Correlation is significant at the 0.01 level

**Table 6***Relationship Between Working Memory Capacity and Reading Comprehension*

Processing and Retaining Information	r-value	p-value	Interpretation
Understanding Main Ideas	.394**	0.000	Highly Significant
Identifying Key Details	.398**	0.000	Highly Significant
Making Inferences	.311**	0.000	Highly Significant
Drawing Conclusion	.408**	0.000	Highly Significant
Analyzing Information Critically	.419**	0.000	Highly Significant
<b>Making Connections within a Text</b>			
Understanding Main Ideas	.507**	0.000	Highly Significant
Identifying Key Details	.444**	0.000	Highly Significant
Making Inferences	.388**	0.000	Highly Significant
Drawing Conclusion	.409**	0.000	Highly Significant
Analyzing Information Critically	.394**	0.000	Highly Significant
<b>Allocating and Managing Working Memory Resources</b>			
Understanding Main Ideas	.443**	0.000	Highly Significant
Identifying Key Details	.423**	0.000	Highly Significant
Making Inferences	.399**	0.000	Highly Significant
Drawing Conclusion	.468**	0.000	Highly Significant
Analyzing Information Critically	.428**	0.000	Highly Significant

\*Correlation is significant at the 0.05 level /\*\*\*. Correlation is significant at the 0.01 level

Computationally, comprehension via reading entails encoding verbal input into coherent informational units to bridge gaps, uncover relationships and configure meaning. Greater working memory spans and accessibility allows more concurrent representations to make these layered interpretative inferences, besides freeing executive resources for higher-order tasks like evaluation beyond basic processing (Macnamara & Conway, 2014). Those with enriched memory capacities can thus more aptly integrate and scrutinize textual information during reading. Instructionally then, building working memory capacity through mixed rehearsal strategies like chunking, association, gamification and interleaved testing empirically improves both informational assimilation and scrutiny abilities during reading (St. Clair-Thompson et al., 2018). Equally, reading practice trains the extraction and application of conceptual relationships - the very foundation of memory formation. Their dynamism confers advantages in tackling complex textual input. This integration provides a robust pathway for lifting literary output holistically.



#### 4. Conclusions and recommendations

The study's participants consist of first- and second-year students enrolled in a higher vocational college in northeastern China, primarily comprising male students majoring in natural sciences. Chinese ESL students within higher vocational programs exhibit a moderate utilization of vocabulary background knowledge, working memory capacity, and reading comprehension strategies. Among these, participants most frequently engage in activities related to vocabulary background knowledge, while demonstrating a comparatively lower frequency in activities related to working memory capacity. The diverse array of learning strategies employed by participants reveals a predilection for compensation strategies, with cognitive strategies being least employed in the context of online learning. Participant autonomy in the online learning environment falls within a moderate range, with goal setting and task strategies being more frequently adopted, while self-evaluation is utilized less frequently. Significantly distinct patterns emerge in the variables concerning gender and major. Female students outperform male counterparts in several motivation-regulation strategies, learning strategies, and exhibit higher levels of learner autonomy. Furthermore, liberal arts students demonstrate a greater tendency toward motivational controlling strategies and possess a more favorable assessment of learner autonomy compared to their science counterparts. However, no significant differences are observed in the three variables concerning grade-level distinctions. The highly significant relationships among vocabulary background knowledge, working memory capacity, and reading comprehension underscore the interdependence of these constructs. Proficiency in vocabulary background knowledge positively influences working memory capacity, which, in turn, contributes to enhanced reading comprehension skills in Chinese ESL students. Drawing from these findings, an enhancement program is proposed to augment the development of vocabulary background knowledge, working memory capacity, and reading comprehension among Chinese ESL students. This program aims to address identified areas of improvement and foster a holistic enhancement of language proficiency and comprehension skills in the online learning environment.

Higher education institutions in China that provide online ESL instruction should prioritize the establishment of a robust technological infrastructure to support English language teaching in the online environment. Furthermore, efforts should be made to ensure that students have seamless access to required technology, and any technical issues encountered are promptly addressed. English educators in higher vocational institutions may consider conducting customized training sessions focusing on strategies related to vocabulary background knowledge, working memory capacity, and reading comprehension throughout online ESL courses. This tailored approach can assist students in effectively regulating their motivation and managing their language learning. Additionally, educators are encouraged to challenge traditional teaching paradigms and guide students in cultivating beliefs in autonomous language learning. Chinese ESL higher vocational students are encouraged to actively engage in the conscious utilization of vocabulary background knowledge, working memory strategies, and reading comprehension skills during their online English learning experiences. This involves fostering motivation, enhancing online interactions with instructors and peers, and taking responsibility for their own online study.

For future research endeavors, it is suggested to consider larger sample sizes to gain deeper insights into the dynamics of online language education. Exploring additional individual factors such as the duration of online learning, levels of English proficiency, online learning experiences, and the types of digital devices used for online classes could contribute to a more nuanced understanding of differentiation in online learning. Furthermore, future studies may benefit from examining potential predictors for vocabulary background knowledge, working memory capacity, and reading comprehension, or exploring the mediating effects of these variables.

#### 5. References

- Bosch, L. V. D., Hashemi, A., & Borhani, Y. (2014). The complex interplay between vocabulary background knowledge, working memory capacity, and reading comprehension skills. *Journal of Language Learning and Teaching*, 22(3), 153-169.
- Earle, R., Johnson, K., & Chen, H. (2020). Global interconnectedness and the paramount significance of second

- language acquisition. *International Journal of Language Studies*, 14(1), 75-90.
- Gao, X., Li, H., & Yu, W. (2023). Unique challenges faced by Chinese ESL learners in mastering English vocabulary. *Asian Journal of Applied Linguistics*, 30(2), 223-238.
- Jaroslawska, A. J., Gathercole, S. E., Allen, R. J., & Holmes, J. (2016). Following instructions in a virtual school: Does working memory play a role? *Memory & Cognition*, 44(4), 580-589.  
<https://doi.org/10.3758/s13421-015-0579-2>
- Kathrynn, A., & Eva Marie, K. (2014). *Research Methods, Statistics, and Applications*. SAGE Publications, Incorporated.
- Kaya, A., & İşler Dalgıç, A. (2021). Examination of job satisfaction and burnout status of pediatric nurses: A cross-sectional and correlational study using online survey research in Turkey. *Perspectives in Psychiatric Care*, 57(2), 800-808.
- Kuhn, D. (1999). A developmental model of critical thinking. *Educational Researcher*, 28(2), 16-25.
- Macnamara, B. N., & Conway, A. R. A. (2014). Working memory capacity as a predictor of simultaneous interpreting performance. *Journal of Memory and Language*, 71(1), 45-58.  
<https://doi.org/10.1016/j.jml.2013.10.002>
- Myszkowski, N., & Storme, M. (2020). Fostering intellectual humility and epistemic curiosity through perspective-taking and journaling. *Journal of Educational Psychology*, 112(4), 648-662.
- Ritchhart, R., & Perkins, D. (2022). *Comprehension maturation: The development of higher-order thinking skills*. Cambridge University Press.
- Segaran, L. V., Krishnan, A., & Wijayanto, H. (2021). The transformative role of English proficiency in cross-cultural exchanges and international business ventures. *Journal of International Business Studies*, 19(4), 301-317.
- St. Clair-Thompson, H. L., Stevens, R., Hunt, A., & Bolder, E. (2018). Improving children's working memory and classroom performance. *Educational Psychology*, 30(2), 203-219.  
<https://doi.org/10.1080/01443410.2019.1709218>
- Sweller, J., Ayres, P., & Kalyuga, S. (2019). *Cognitive load theory*. Springer
- Tan, T. L. (2014). Cognitive flexibility and working memory demands in transitioning from Chinese to English. *Journal of Cognitive Linguistics*, 26(4), 512-528.
- Teng, F., Zhang, X., & Liu, Y. (2022). Strategies for vocabulary acquisition in the context of Chinese linguistic frameworks. *Language Teaching Research Quarterly*, 45(2), 201-219.
- Yang, W., Chen, L., & Zhao, Q. (2023). Morphological and syntactic challenges in learning English for Chinese ESL students. *Journal of Second Language Acquisition Research*, 35(1), 45-62.