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Exploring Proficiency and Task Effects on Taiwanese EFL Learners' Understanding of English Vertical Axis Prepositions: *Above, Below, Over, and Under*

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ABSTRACT

This research aims to examine how Taiwanese students, who are learning English as a foreign language, comprehend the core meanings of English vertical axis prepositions such as *above*, *over*, *below*, and *under*. It also investigates how different proficiency levels and task types influence their understanding of these prepositions. Fifty-four college freshmen participated in the study. They were categorized into basic, intermediate, and advanced proficiency groups. A control group of eighteen native English speakers was also included. Two types of tasks—sentence-in-isolation and sentence-in-context—were employed in a sentence-completion format. The findings suggest that the core meanings of the four prepositions were similarly difficult. However, understanding the extended meaning of *under* appeared to be the easiest overall, followed by the other three prepositions. Proficiency levels significantly impacted the results. Beginner learners struggled more with extended meanings overall, while advanced learners outperformed intermediate learners in both basic and extended meanings. Additionally, intermediate and advanced learners exhibited similar patterns in acquiring individual extended meanings.

Keywords: Vertical Prepositions; Core Meanings; Extended Meanings; Task; Proficiency

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1. Introduction

Prepositions are notoriously challenging for learners due to their diverse functions and the absence of clear, consistent rules for their correct usage^[1]. This challenge is particularly pronounced for second language learners, as English prepositions often lack direct equivalents in other languages. Tyler and Evans highlight that English prepositions originally described spatial relationships between physical entities, grounded in human experiences of space^[2]. Over time, these prepositions evolved, developing non-spatial meanings that are systematically derived from their original spatial contexts. They can be categorized based on the spatial dimensions they represent. For example, prepositions such as *over*, *under*, *above*, and *below* are associated with the vertical axis. While their primary meanings pertain to spatial relationships, these prepositions also convey abstract meanings. Consider the sentence “The basket is under the chair,” where *under* signifies a physical relationship. In contrast, in “The worker is under Charlie,” *under* expresses a hierarchical relationship, indicating authority.

This ability of prepositions to convey both literal and metaphorical meanings complicates language learning^[3]. For example, in the sentence “The vase is on the table,” *on* indicates both elevation and contact between the vase (trajectory) and the table (landmark)^[4]. Recognizing these metaphorical extensions is often a difficult task for learners.

This study focuses on the prepositions *above*, *over*, *below*, and *under*, particularly due to discrepancies between their core and metaphorical meanings. While *over* and *above* may seem synonymous in their “higher-than” sense, as in “The picture is above the mantel” and “The picture is over the mantel,” they diverge in specific contexts. For example, “The maid hung the jacket over the back of the chair” implies contact between the jacket and the chair, whereas “The maid hung the jacket above the back of the chair” suggests no contact^[2]. Similarly, *below* and *under* differ in the distance they imply between the trajectory and the landmark. *Below* permits a greater distance, as seen in “The valley is far below the tallest peak,” while *under* typically implies closer proximity, making “The valley is far under the tallest peak” incorrect^[2]. Further differences arise when considering the distance between trajectory and landmark. Taylor argues that in “He lives ten floors above me,” *above* is appropriate due to the significant distance, whereas “He lives ten floors

over me” is unacceptable^[5]. The preposition *over* implies a closer spatial relationship and often connotes influence or contact, as in “Moving the lamp down over the table” compared to “Moving the lamp down above the table.” Additionally, Aajami distinguishes *over* and *above* based on whether the trajectory is directly higher than the landmark. For instance, “The ball is over the tree” indicates the ball is directly higher, while “The ball is above the tree” allows for a more general vertical relationship^[6].

The extended meanings of these prepositions further complicate their usage. For instance, *above* is used with arbitrary reference points, as in “The village is 100 meters above sea level” or “The temperature is 50 degrees above zero.” In contrast, *over* is applied to critical values, as in “It cost over a million pounds” or “A man over sixty years old”^[5].

Learners of English as a second language, particularly those from Chinese backgrounds, face additional challenges due to differences in how their native language expresses spatial relationships. In Chinese, prepositions and postpositions are often combined, which can lead to errors such as “There is a pillow below her head” instead of *under*^[7]. Even advanced learners may struggle with these distinctions, frequently confusing *over* with *above* and *under* with *below*, demonstrating difficulties in grasping the contact implications of these prepositions^[8].

Negative transfer from the learners’ native language grammar to English contributes to these errors. Xu identifies several common mistakes, including overgeneralization, neglect of L2 rules, incomplete rule application, and the creation of imaginary L2 rules^[9]. Interlingual errors, caused by negative transfer, are more common among beginners but tend to decrease as proficiency increases, giving way to more intralingual errors^[10-12].

In summary, this study investigates the use of the four vertical axis prepositions among English as a Foreign Language (EFL) learners, exploring the influence of L2 proficiency and L1 knowledge on their acquisition. The research questions guiding this study are as follows:

- 1) What is the relative learning difficulty of vertical axis prepositions (*above*, *over*, *below*, and *under*) in terms of their core meanings?
- 2) Which vertical axis prepositions are easier to acquire in terms of their extended meanings?

Understanding these dynamics can contribute to the field of second language acquisition and inform the development of more effective teaching strategies.

2. Meanings of Vertical Prepositions

This study investigates the prepositions *above*, *over*, *below*, and *under* due to their low frequency of usage^[13, 14]. These prepositions are examined within one spatial meaning and two extended meanings. The spatial meaning includes “physical contact/distal” distinctions, while the extended meanings include “subjective-more/less” and “superior/inferior-control.” Specifically, the “contact” meaning is observed in *over* and *under*, and the “distal” sense in *above* and *below*. The “more” sense is conveyed by *above* and *over*, and the “less” sense by *below* and *under*. The “superiority” sense is expressed by *above* and *over*, whereas the “inferiority” sense is reflected in *below* and *under*.

2.1. Above

Above₀: Prototypical Meaning

Above indicates that the TR (Trajector) is positioned higher than the LM (Landmark) with no contact between them^[2, 5, 15].

- (1) The castle above the lake is gorgeous.
- (2) There is a mirror above the sink.

Above₁: Distal Meaning

Above often co-occurs with modifiers indicating distance^[2, 5, 15].

- (3) The bridge is two miles above the waterfall.
- (4) The aircraft is flying high above the city.

Above₂: More in Quantity

Above, which expresses vertical elevation, also extends to convey the meaning of “more”^[2].

- (5) The price of that stock is now above \$20.
- (6) Pietro was not above 23 years of age.

Above₃: Superior Without Control

Above conveys a sense of superiority without control^[2, 5, 15].

- (7) He was the father of the gods and was above all gods.
- (8) Mary has a strange power over John.

2.2. Over

Over₀: Prototypical Meaning

Over expresses a higher relation while allowing for the possibility of contact^[16–18].

- (9) Around 10 pm our plane flew over London.
- (10) The bee is hovering over the flower.

Over₁: Contact Meaning

Over indicates a vertically higher relation and potential contact.

- (11) The veil over the princess’ face is beautiful.
- (12) The cross-country skier skimmed over the snow.

Over₂: More in Quantity

Over also conveys a “more” sense^[2].

- (13) This year’s profits are over 1969.
- (14) He weighs just over 150 pounds.

Over₃: Superior with Control

Over includes a sense of superiority and control^[2, 5].

- (15) Camilla has authority over purchasing.
- (16) The chair presided over the meeting.

2.3. Below

Below₀: Prototypical Meaning

Below describes an object positioned lower than another without physical contact^[2, 5, 15].

- (17) The woman was sitting below my balcony.
- (18) A stranger passed the garden below my window.

Below₁: Distal Meaning

Below often collocates with modifiers indicating distance^[2].

- (19) The hydroelectric station is five miles below the dam.
- (20) The stone is farther below the surface of the lake.

Below₂: Less in Quantity

Below signifies a lesser quantity^[2].

- (21) A temperature below 300 °C.
- (22) The water level is far below what is needed to supply the district.

Below₃: Inferior Without Control

Below also conveys a sense of inferiority without control^[2, 15].

- (23) Timothy is below Alan in the law firm.
- (24) Policy officers below the level of presidential appointees.

2.4. Under

Under₀: Prototypical Meaning

Under indicates a lower relationship between two entities

with or without contact^[2, 5, 15].

(25) My father sat under the chandelier.

(26) The life jacket is kept under the seat.

Under₁: Contact Meaning

Under expresses a vertically lower relation with contact.

(27) I held the gun under my arm.

(28) The table is under the tablecloth.

Under₂: Less in Quantity

Under conveys a “less” sense in terms of quantity^[2, 15].

(29) This champagne should cost under 20 US dollars.

(30) The government decided to exempt incomes under \$4,000.

Under₃: Inferior with Control

Under also includes a sense of inferiority and control^[2, 15].

(31) George works under his father’s close supervision.

(32) The Hungarians groaned under Turkish rule.

In conclusion, the prepositions *above*, *over*, *below*, and *under* demonstrate distinct spatial and extended meanings in the English language, influenced by human experiences and cognitive schemas, as shown in **Table 1** below.

Table 1. A comparison of core and extended meanings of the four vertical prepositions in English.

Meaning	Semantic Feature	Above	Over	Below	Under	
core	[+/-vertically high]	+	+	-	-	
	[+/-subjectively considerable in distance]	+	-	+	-	
extended	meaning 1					
		[+/-physical contact] ¹	-	+	-	+
		[+/-covering]	-	+	-	+
	meaning 2	[+/-subjectively more in quantity]	+	-	+	-
extended	meaning 3					
		[+/-superior]	+	+	-	-
		[+/-control]	-	+	-	+

These prepositions are not only used to describe physical positions but also convey abstract concepts such as quantity and control. *Above* and *over* both indicate vertical elevation but differ in terms of physical contact; *above* implies no contact, while *over* allows for the possibility of contact. Similarly, *below* and *under* signify vertical depth, with *below* indicating no contact and *under* often implying contact. In their extended meanings, *above* and *over* are used to express superiority, with *above* focusing on a non-controlling superiority and *over* indicating control. Conversely, *below* and *under* convey inferiority, with *below* suggesting a lack of control and *under* implying subordination with control. These differences highlight the complexity of prepositional usage in English, revealing how language can encapsulate both concrete spatial relationships and abstract hierarchical concepts. Understanding these subtleties enhances our comprehension of language structure and its role in human cognition.

3. Empirical Studies of Vertical Prepositions

Empirical research on the acquisition of English prepositions by non-native speakers encompasses various dimensions, including the effects of first language (L1) transfer, proficiency levels, and the frequency of prepositions in the target language. Here is an overview of notable studies in this area:

Firstly, Lowi and Verspoor investigated Dutch ESL learners’ acquisition of English prepositions, focusing on the influence of L1 formal similarity and L2 frequency^[19]. Their study involved a fill-in-the-blank test with 25 items to analyze how prepositions with varying frequencies and similarities to Dutch were acquired. The study included 68 Dutch EFL learners, divided into three proficiency groups. The findings indicated that advanced learners were less influenced by L1 similarity or L2 frequency compared to beginner and intermediate learners. Prepositions like *over* and *above*,

¹It is noted that the sense of contact embedded in *over* and *under* is optional. That is, the notion of contact is not a prerequisite for *over* and *under*, as indicated by the +/- notation in **Table 1**.

which both translate to *boven* in Dutch, posed challenges due to conceptual distinctions lacking in Dutch. Additionally, the study revealed that certain prepositions, such as *in* and *on*, were acquired more easily due to their high frequency in both English and Dutch. The study suggested further exploration into L1 distinctions and their impact on L2 acquisition, particularly for prepositions that do not have direct translations.

In addition, Chan et al. explored the acquisition of locative and directional prepositions by Malaysian Chinese ESL learners^[8]. They recruited 30 participants across three proficiency levels (elementary, intermediate, and advanced) and used a test with multiple-choice questions, match-ups, fill-in-the-blanks, and sentence correction tasks. Results showed that proficiency positively affected acquisition, with higher proficiency groups performing better. Notably, the preposition *under* had a high error rate, while *over* was more easily acquired. L1 transfer errors were also evident, particularly when prepositional meanings differed between Chinese and English. The study concluded that richer contexts did not necessarily lead to higher accuracy. Additionally, learners often misused *in* and *at*, reflecting the difficulty of transferring spatial concepts from Chinese to English. The study emphasized the need for targeted instruction on prepositions with significant L1-L2 differences.

Similarly, Kaneko analyzed Japanese EFL learners' use of vertical axis prepositions (*above*, *over*, *below*, *under*) through a corpus study^[13]. Data from the NICT JLE Corpus revealed that the frequency of preposition use correlated with proficiency. Learners were categorized into three proficiency groups, and their use of prepositions was compared to native speakers' usage in the British National Corpus. Results indicated that learners increased their use of prepositions with proficiency but still struggled with extended meanings. Errors were common even among advanced learners, suggesting that learners initially grasp proto-scene meanings before attempting extended meanings. Furthermore, the study highlighted that Japanese learners often confused *under* and *below*, likely due to the lack of direct equivalents in Japanese. Kaneko recommended more focused instruction on prepositions' extended meanings and their pragmatic use in different contexts.

Moreover, Mueller examined whether advanced ESL learners used collocational knowledge to interpret extended meanings of prepositions^[20]. The study involved 90 participants (native speakers of Chinese, Korean, and Spanish) who

took a fill-in-the-blank test with high- and low-frequency word co-occurrences. Results showed higher correct rates for high-frequency items, supporting the hypothesis that collocational knowledge influences the interpretation of prepositional meanings. The study highlighted the importance of frequency in second language acquisition (SLA) and suggested further research involving diverse L1 backgrounds and educational levels. Additionally, Mueller's findings indicated that learners often relied on rote memorization for high-frequency collocations, which helped them in tests but did not necessarily translate to accurate usage in spontaneous speech. The study suggested integrating collocational practice in communicative activities to enhance learners' practical understanding of prepositions.

Finally, Li and Cai investigated L1 Chinese transfer effects on Chinese EFL learners' acquisition of English prepositions^[7]. They conducted a sentence-completion task with 60 Chinese learners and 15 native English speakers. The study examined how learners used prepositions like *above*, *over*, *below*, and *under* in various contexts. Results revealed significant L1 transfer effects, especially with vertical polarity prepositions. Learners struggled with conceptual distinctions not present in Chinese. Interviews with participants confirmed the influence of L1 transfer, with many errors attributed to non-linguistic cognitive factors. The study also noted that advanced learners continued to make errors with less frequent prepositions, suggesting a need for more comprehensive exposure and practice. Li and Cai recommended incorporating visual aids and spatial reasoning exercises to help learners internalize the spatial relationships expressed by different prepositions.

In summary, the major findings of these studies reveal several important aspects of preposition acquisition among EFL learners. Firstly, L1 transfer was identified as a significant factor in learners' performance. Lowi and Verspoor found evidence of transfer effects in beginner and intermediate groups, but not in advanced Dutch learners^[19]. Kaneko highlighted L1 influence in Japanese learners' acquisition of *under*^[13]. Higher proficiency levels generally correlated with better performance^[7, 8, 13, 19], although advanced learners still faced challenges with certain prepositions. The acquisition order for prepositions like *over* and *under* was inconsistent across studies. Frequency played a significant role in L2 acquisition, affecting beginner and intermediate learners more

than advanced ones^[19, 20]. Chan et al. found that providing richer contexts did not necessarily improve accuracy^[8]. Kaneko noted that Japanese learners found literal senses of prepositions easier to acquire than metaphorical senses^[13].

However, these studies had several limitations. Most focused either on the literal or metaphorical senses of prepositions, but not both. Lowi and Verspoor and Li and Cai used a limited number of task items, which may not comprehensively represent learners' understanding^[7, 19]. Task design limitations were also identified in Mueller^[20]. Participant variety was another issue; for instance, Li and Cai included only two proficiency groups, and Mueller lacked a control group and diverse proficiency levels^[7, 20]. Future research should address these limitations by incorporating a broader range of task items and participants with diverse backgrounds and proficiency levels.

To conclude, empirical research on vertical prepositions in English highlights the complex interplay between L1 transfer, proficiency levels, and frequency. While higher proficiency generally leads to better acquisition, challenges remain, particularly with less frequent or metaphorical uses of prepositions. Future research should aim to address the limitations identified, such as expanding task items and participant diversity, to provide a more comprehensive understanding of how non-native speakers learn English prepositions. Additionally, more focus on the combined impact of literal and metaphorical senses in task designs could provide deeper insights into the acquisition process and help develop more effective teaching strategies.

4. Research Design

4.1. Participants

This study examines how Mandarin-speaking EFL learners in Taiwan acquire English spatial prepositions as part of their second language learning. Participants were selected based on varying levels of L2 proficiency, which was considered a key factor in the acquisition of English prepositions. The study included 54 non-English major freshmen from various departments at a public university and 18 native English speakers, all recruited from northern Taiwan. The non-English major freshmen were enrolled in a Freshman English course that met once a week for two semesters, designed to improve active reading skills, fluency, and general

subject knowledge. At the beginning of the first semester, participants were grouped into five proficiency levels according to their College Entrance Exam scores. In addition to the native speakers, the EFL learners were categorized into three proficiency groups: basic, intermediate, and advanced.

4.2. Tasks and Materials

Previous empirical studies have employed various approaches to examine EFL learners' abilities to interpret prepositional meanings. Among these, the sentence-completion task (SCT) has been predominantly used^[7, 8, 19, 20]. For instance, Mueller used an SCT that provided 15 prepositions for participants to choose from^[20]. In contrast, Lowi and Verspoor utilized an SCT without prepositional choices to investigate the role of L1 formal similarity in Dutch EFL learners' acquisition of English prepositions^[19]. Similarly, Li and Cai designed an SCT without provided choices to examine the influence of L1 transfer on Chinese EFL learners' acquisition of English prepositions^[7]. The present study aims to explore how Taiwanese EFL learners perceive subtle differences among four verticality-related prepositions. Therefore, instead of allowing participants to freely select prepositions, a controlled SCT format was adopted, offering a choice of four prepositions—*above*, *over*, *below*, and *under*—for sentence completion.

Two tasks were designed to investigate the acquisition of prepositions, taking into account both proficiency and categorical effects. Task 1, the Sentence-in-Isolation (SII) Task, focused on the core meanings of vertical prepositions. Participants were given incomplete sentences accompanied by pictures to help visualize the spatial relationship between the Trajectory Reference (TR) and the Landmark (LM). For example, images of an apartment and a bridge over a pond were provided as visual references. Task 2, the Sentence-in-Context (SIC) Task, involved incomplete sentences within a two-turn conversational context. These conversations were designed to reflect subjective notions of more or less between interlocutors, along with a control notion. Participants were asked to complete the task by selecting a preposition that conveyed either a prototypical or extended meaning.

According to Zwarts and Winter, locative prepositions, unlike directional prepositions, do not resist predicative constructions^[21]. To avoid any motion-related sense embedded in the verb, most target sentences were framed with a "be"

verb and a missing preposition. The purpose of both tasks was to identify whether there are variations in EFL learners' interpretations of the prepositions *above*, *over*, *below*, and *under*.

In the SII Task, each sentence includes a blank for a missing preposition, accompanied by corresponding pictures. **Table 2** provides an example of this task, featuring a picture of five people living in the same apartment. The aim of this task is to assess participants' understanding of varying degrees of verticality, with a man named John serving as the reference point.

The correct answers for Sentences 1 and 2 are *below* and *above*, respectively. In Sentence 1, Terry lives ten floors lower than John, while in Sentence 2, Teresa lives ten floors higher than John.

In the SIC Task, each sentence contains a blank for a

missing preposition within a two-turn conversation between two speakers, as shown in **Table 3**.

Table 2. An example of the SII task.

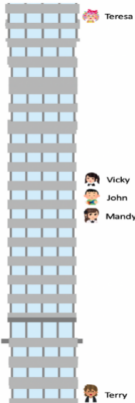
Participants Saw:	Participants Read the Following:
	1. Terry lived _____ John. 2. Teresa lived _____ John. Answer: <i>below, above</i>

Table 3. An example of the SIC task.

Participants Read the Following:
3. A: Have you ever visited the temple on that mountain? B: Yes, I have. The temple is situated three kilometers _____ the base of the mountain. A: Wow, that sounds like quite a climb! Is it difficult to reach? B: It can be challenging, but the stunning views from the temple make it worth it. 4. A: Mom, why did you put the new tablecloth _____ the table? B: We have an important speaker coming today, so we wanted to make the table look nice. A: Ah, so the new tablecloth adds a touch of elegance for the occasion? B: Exactly! It helps create an inviting atmosphere for our guest. Answer: <i>above, over</i>

4.3. Procedures

This study investigates the L2 acquisition of English polarity prepositions in both prototypical and extended contexts using sentences with blanks presented in isolation and within context. Participants of varying English proficiency levels were recruited, and they signed a consent form after being informed that the tasks were for academic research purposes only and that all collected data would remain confidential. Clear instructions were provided to ensure participants understood the task formats. They were instructed to complete the SII Task first, followed by the SIC Task. The SII Task took approximately 10 minutes to complete, while the SIC Task took about 15 minutes.

For scoring, participants received one point for each correct answer. No points were awarded for incorrect or missing responses, but if participants selected prepositions

with the same polarity (e.g., *over* instead of *above*), they were awarded 0.5 points. Mean scores for each group across both tasks were then calculated. Statistical analysis was conducted using R. Descriptive statistics, such as mean scores and standard deviations, were calculated to provide an overview of the data. Additionally, one-way and two-way analyses of variance (ANOVA) were performed to examine the effects of proficiency and task type on participants' performance in interpreting these prepositions.

5. Results and Discussion

5.1. Core Meaning Type Effect in Vertical Prepositions

Table 4 presents the main effects of a two-way ANOVA, analyzing L2 proficiency levels (Basic, Intermediate, Ad-

vanced, and Control-Native) and Core Meaning Preposition Type (*above*, *over*, *below*, and *under*) as the independent variables, with participants' accuracy as the dependent variable. The results indicate a significant effect of proficiency ($F(3, 272) = 9.546, p < 0.001$), highlighting differences in participants' understanding of the core meanings of the four English vertical prepositions.

Given the absence of a significant effect among the different Core Meaning Preposition Types, **Table 5** presents

the mean scores for each preposition across the various proficiency groups in the Picture Task. The results indicate that all groups performed similarly in interpreting the core meanings of vertical prepositions.

As previously noted, a significant effect of proficiency was observed. A one-way ANOVA, shown in **Table 6**, highlighted that the proficiency effect was only evident for *above* ($p < 0.001$) and *below* ($p < 0.05$), while no significant effect was found for *over* and *under*.

Table 4. Two-way ANOVA of core meaning preposition type and proficiency.

	<i>Df</i>	<i>Sum Sq</i>	<i>Mean Sq</i>	<i>F Value</i>	<i>p-Value</i>
CM Preposition Type	3	0.188	0.0625	0.911	0.436
Proficiency	3	1.965	0.6551	9.546	5.15e-06 *** ²
CM Preposition Type* Proficiency	9	0.792	0.0880	1.282	0.247
Residuals	272	18.667	0.0686		

Note. CM = Core Meaning; * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

Table 5. *P*-values for within-group differences across core meaning types.

Group	<i>above</i> ₀		<i>over</i> ₀		<i>below</i> ₀		<i>under</i> ₀		<i>p-Value</i>
	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	
G1: Basic	0.56	0.34	0.75	0.31	0.67	0.34	0.78	0.39	0.225
G2: Intermediate	0.75	0.26	0.72	0.26	0.81	0.25	0.83	0.24	0.537
G3: Advanced	0.86	0.23	0.78	0.26	0.86	0.23	0.89	0.21	0.517
G4: Native	0.97	0.12	0.86	0.23	0.94	0.16	0.86	0.23	0.194

Table 6. *P*-values for between-group differences within core meaning types.

CM Type	<i>above</i> ₀	<i>over</i> ₀	<i>below</i> ₀	<i>under</i> ₀
<i>p-value</i>	<0.001	0.43	<0.05	0.67

To further pinpoint specific areas of proficiency effects within *above* and *below*, a Tukey HSD post hoc analysis was conducted, as shown in **Table 7**. For *above*, significant differences were observed between the advanced and basic groups ($p < 0.01$), the native and basic groups ($p < 0.001$), and the native and intermediate groups ($p < 0.05$). For *below*, a significant difference was found between the basic and native groups. No significant differences were identified for *over* and *under*.

Finally, to gain a comprehensive understanding of the acquisition order of core meanings by EFL learners, the mean scores of the three EFL participant groups (Basic, Intermediate, and Advanced) were combined and averaged to represent a unified EFL group. Tukey multiple comparisons of means were performed with a 95% family-wise confidence level,

as shown in **Table 8**. The results revealed no statistically significant differences in the difficulty levels of the various vertical prepositions.

Regarding the type effect related to core meanings, as previously noted, no discernible type effect was observed in the perception of these core meanings. Consequently, it was concluded that the difficulty order of the four vertical prepositions remained consistent. In other words, each vertical preposition appeared to be acquired at a similar stage, with learners approaching all four in a uniform manner during their learning process. Evans and Tyler connected the concept of predominance to the selection of the primary (protoscene) meaning, suggesting that the meaning most frequently encountered in various contexts might serve as the primary sense^[22]. Furthermore, the theory of markedness argues that

²The notation "e-06" in the *p*-value for Proficiency represents 10^{-6} . Therefore, a *p*-value of 5.15e-06 is equivalent to 5.15×10^{-6} .

more fundamental and commonly used linguistic elements are considered unmarked^[23], while less frequent elements are labeled as marked. In this context, unmarked forms, which include core meanings, are typically acquired before marked ones. Similarly, Clark’s complexity hypothesis suggests that if there are two terms, A and B, and B requires all

the rules of A plus an additional one, A is usually mastered before B^[24]. In summary, the findings indicate that EFL learners demonstrated similar proficiency in understanding the core meanings of each vertical preposition, suggesting that core meanings (unmarked forms) are relatively easier to acquire.

Table 7. *P*-values for pairwise between-group differences within core meaning types.

Type	B-I	B-A	B-N	I-A	I-N	A-N
<i>above</i> ₀	0.10	<0.01	<0.001	0.54	<0.05	0.54
<i>over</i> ₀	0.99	0.99	0.59	0.92	0.40	0.78
<i>below</i> ₀	0.37	0.11	<0.01	0.91	0.37	0.76
<i>under</i> ₀	0.93	0.63	0.81	0.93	0.99	0.99

Note. B = Basic; I = Intermediate; A = Advanced; N = Native.

Table 8. *P*-values for pairwise differences between core meaning types within the EFL group.

Group	A-O	A-B	A-U	O-B	O-U	B-U
EFL	1.0	0.96	0.38	1.0	0.74	0.96

Note. A = *above*; O = *over*; B = *below*; U = *under*.

In terms of the proficiency effect, notable differences emerged in the meaning scores for *above* across different proficiency groups. Specifically, the basic group’s performance in interpreting *above* was significantly lower than that of the advanced learners and native speakers. Likewise, the intermediate group scored significantly lower than the native group on ‘above.’ For *below*, native speakers performed significantly better than the basic group. These disparities highlight the challenges faced by lower-proficiency EFL learners, particularly in understanding the core meanings of *above* and *below*. A plausible explanation for these challenges could be related to the frequency of exposure. As noted by Lowi and Verspoor^[19], the frequency of prepositions plays a significant role in the performance of English learners at basic and intermediate levels. Chen further highlighted that *above* and *below* appear much less frequently than *over* and *under* in English textbooks used in Taiwan^[25]. For example, *over* appears nearly seven times more frequently than *above* (75 vs. 11), while *under* occurs about six times more often than *below* (25 vs. 4). Additionally, Rhee’s analysis of the 20 most frequently encountered English prepositions revealed that *over* ranked 16th and *under* 19th, while *above* and *below* did not make the top 20^[26].

Another potential explanation for the learners’ lower performance on *above* and *below* may be related to their

semantic features. As discussed in Section 2, *above* and *below* share the feature of [+ subjectively great in distance]. The concept of being far away is likely more challenging to acquire than the concept of being close. In sum, the disparity in frequency and the semantic feature of [+/- subjectively great in distance] may explain why learners at lower proficiency levels were able to achieve native-like performance with *over* and *under* but struggled with *above* and *below*.

Additionally, when examining the interpretation of *under* by native speakers, varying conceptualizations of this preposition were revealed. To illustrate, brief interviews were conducted to capture participants’ perceptions of *under*, providing insights into their understanding.

(33) The fish below the boy means the boy could not see the fish.” (G4, Participant 17)

(34) I think *under* does not mean directly lower to me. (G4, Participant 4)

In reviewing Castelfranchi and Parisi’s work^[27], Taylor discussed the concept of “perceptual unity” in relation to the Italian word *su*, emphasizing that “both the trajector (TM) and the landmark (LM) must be within the field of vision of a potential observer”^[5]. In the visual scenario used in the SII Task with Pictures (SCT-P) to assess participants’ understanding of *under*, which featured a bridge and water,

the configuration obscured the view of the fish, potentially affecting participants' responses. This pictorial design might also influence native speakers' perceptions. The preposition *under* was found to be the easiest for EFL learners to understand because its spatial meaning is concrete and frequently encountered in everyday contexts. It typically refers to a straightforward vertical relationship, where one object is positioned directly beneath another, making it easier to visualize and comprehend. In contrast, *below*, while similar, can have both spatial and more abstract uses, such as hierarchical or figurative meanings. This flexibility in usage may make *below* slightly more challenging for learners, as it introduces a broader range of contexts. Additionally, *under* has fewer abstract or extended meanings, reducing potential confusion for learners at various proficiency levels.

Finally, with regard to the acquisition sequence of core meanings for EFL learners (Basic, Intermediate, and Advanced), statistical analysis revealed no significant differences among the scores for *above*, *over*, *below*, and *under*.

This suggests that no particular preposition showed a clear advantage in terms of acquisition across proficiency levels. The acquisition sequence of core meanings within the combined EFL group remained consistent, with no single preposition standing out: *above*₀ = *over*₀ = *below*₀ = *under*₀.

5.2. Extended Meaning Type Effect in Vertical Prepositions

Table 9 exhibits the main effects derived from a two-way ANOVA, incorporating L2 proficiency (Basic, Intermediate, Advanced and Control-native) and Extended Meaning Preposition Type (*above*, *over*, *below* and *under*) as the independent variable and the participants' accurate responses as the dependent variable. The results highlight significant effects of Extended Meaning (EM) Preposition Type ($F(3, 1712) = 8.917, p < 0.001$), Proficiency ($F(3, 1712) = 82.357, p < 0.001$) and a significant interaction effect between these two factors ($F(9, 1712) = 3.369, p < 0.001$).

Table 9. Two-way ANOVA of proficiency and extended meaning preposition type³.

	Df	Sum Sq	Mean Sq	F Value	p-Value
EM Preposition Type	3	3.30	1.099	8.917	7.31e-06 ***
Proficiency	3	30.46	10.153	82.357	<2e-16 ***
EM Preposition Type* Proficiency	9	3.74	0.415	3.369	0.000418 ***
Residuals	1712	211.06	0.123		

Note. EM = Extended Meaning; * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

Firstly, prompted by the observed significance, a one-way ANOVA was conducted to investigate the type effect, with the mean scores presented in Table 10. The mean scores for three types of extended meanings (distance, number, and status) were summed and averaged from the Conversation

Task, providing an overall mean score for each preposition. The findings revealed a statistically significant difference in performance between G3 and G4 ($p < 0.001$) across the four prepositions, while no significant differences were observed between G1 and G2.

Table 10. P-values for between-type differences within groups for overall extended meanings.

Group	<i>above</i> ₄		<i>over</i> ₄		<i>below</i> ₄		<i>under</i> ₄		p-Value
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
G1: Basic	0.46	0.40	0.51	0.43	0.39	0.41	0.47	0.42	0.196
G2: Intermediate	0.69	0.33	0.61	0.33	0.65	0.42	0.73	0.35	0.0764
G3: Advanced	0.67	0.34	0.72	0.27	0.72	0.34	0.91	0.25	3.34e-08 ***
G4: Native	0.75	0.32	0.74	0.33	0.86	0.31	0.88	0.30	0.000747 ***

Note. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

³The notation "e" in p-values represents powers of 10. For example, "e-06" stands for 10^{-6} , so a p-value of 7.31e-06 is equivalent to 7.31×10^{-6} . Similarly, "e-16" represents 10^{-16} , meaning 2e-16 equals 2×10^{-16} , and "e-08" represents 10^{-8} , making 3.34e-08 equivalent to 3.34×10^{-8} .

Following the observation of statistical significance in G3 and G4, a more detailed examination of these groups is warranted, as shown in **Table 11**. The Tukey HSD post hoc analysis revealed that G3 achieved significantly higher scores on *under* compared to the other three prepositions. Additionally, G4 scored substantially higher on *below and under* than on *above* and *over*.

The proficiency effect is a key factor throughout the current study. **Table 12** presents a statistically significant proficiency effect across the four prepositions, as revealed by a one-way ANOVA.

Upon further examination, additional insights into the significance emerged through a Tukey HSD post hoc analysis detailed in **Table 13**.

Table 11. *P*-values for pairwise between-type differences within groups for extended meanings.

Group	A-O	A-B	A-U	O-B	O-U	B-U
Advanced	0.61	0.53	<0.001	1.0	<0.001	<0.001
Native	1.0	<0.05	<0.05	<0.05	<0.01	1.0

Note. A = *above*₄; O = *over*₄; B = *below*₄; U = *under*₄.

Table 12. *P*-values for between-group differences within types of extended meanings.

EM Type	<i>above</i> ₄	<i>over</i> ₄	<i>below</i> ₄	<i>under</i> ₄
<i>p</i> -value	<0.001	<0.001	<0.001	<0.001

Table 13. *P*-values for pairwise between-group differences within types of extended meanings.

Type	B-I	B-A	B-N	I-A	I-N	A-N
<i>above</i> ₄	<0.001	<0.001	<0.001	0.98	0.59	0.35
<i>over</i> ₄	0.16	<0.001	<0.001	0.08	0.03	0.98
<i>below</i> ₄	<0.001	<0.001	<0.001	0.52	<0.001	0.04
<i>under</i> ₄	<0.001	<0.001	<0.001	<0.001	<0.001	0.89

Note. B = Basic; I = Intermediate; A = Advanced; N = Native.

This comparison within subtypes highlighted significant differences in overall extended meanings between the basic group and both the advanced ($p < 0.001$) and control groups ($p < 0.001$) across each preposition. However, no statistical difference was observed between the advanced and control groups ($p > 0.05$) when interpreting the overall extended meanings across all vertical prepositions. As presented earlier in **Table 10**, the mean score of *under* from native speakers was slightly lower than that from the advanced group, the difference did not reach a statistical significance ($p = 0.89$). Still, although the intermediate group scored slightly higher than the advanced group on *above*, there was no statistical significance ($p = 0.98$). In general, the results underscored that the advanced group significantly outperformed the basic group in comprehending extended meanings across each preposition ($p < 0.001$). Additionally, the intermediate group achieved significantly higher mean

scores than the basic group on *above*, *below*, and *under* ($p < 0.001$). Furthermore, advanced learners excelled significantly more than intermediate learners in interpreting *under* ($p < 0.001$), while the native group performed significantly better than the intermediate group in comprehending *under* and *below* ($p < 0.01$). Lastly, no significant differences were observed in the overall meaning of prepositions between the advanced and native groups.

To conclude, the mean scores of three EFL participant groups (Basic, Intermediate, and Advanced) were combined and averaged, representing a unified EFL group. Tukey multiple comparisons of means with 95% family-wise confidence level were conducted. Based on the results in **Table 14**, where *under* exhibited the highest mean score, the order of difficulty for extended meanings among the unified EFL group was as follows: *above* = *over* = *below* > *under* (considered the least challenging).

Table 14. P-values for pairwise differences between core meaning types within the EFL group.

Group	A-O	A-B	A-U	O-B	O-U	B-U
EFL	1.0	1.0	<0.05	1.0	<0.05	<0.01

Note. A = *above*₄; O = *over*₄; B = *below*₄; U = *under*₄.

Unlike the core meanings, a distinct type effect emerged in the overall extended meanings of vertical prepositions, as demonstrated in **Table 9**. This type effect was particularly noticeable in the advanced and native groups. Native speakers performed significantly better with *under* and *below* compared to *above* and *over*. Similarly, the advanced group outperformed the other three vertical prepositions, particularly excelling in *under*. In contrast, no statistical variation in the type effect was observed in the basic and intermediate groups.

These findings align with Mueller’s observation that advanced English learners showed a higher accuracy rate for *under* compared to *over* in their understanding of extended prepositional meanings^[20]. The advanced group’s performance mirrored that of the native group, particularly in their superior scores for *under*. Conversely, both the basic and intermediate groups showed significantly lower mean scores for *under* than the advanced group ($p < 0.001$), with no significant difference between the advanced and native groups ($p = 0.89$). This suggests that understanding the extended meaning of *under* posed considerable challenges for EFL learners at the basic and intermediate levels. As shown in **Table 10**, the basic and intermediate groups exhibited similar perceptions across the four prepositions. However, upon reaching an advanced proficiency level, a divergence in perceptions emerged, closely aligning with the native speakers’ trichotomous understanding of the four vertical prepositions.

Regarding the proficiency effect, it became evident that this effect manifested differently across each vertical preposition. To explain why learners at different proficiency levels demonstrated varying understandings of prepositions, it was hypothesized that L1 transfer played a significant role in the performance of EFL learners with English prepositions^[7, 8, 13, 19]. To assess Chinese EFL learners’ grasp of the extended meanings of prepositions, this study focused on three extended meanings: contact, number, and status.

Li and Cai’s research on L1 transfer in Chinese EFL learners’ use of English vertical prepositions noted that *shang* ‘above; over’ denotes a positive vertical direction, adaptable to both *above* and *over*^[7]. Conversely, *xia* ‘below; under’

represents a negative polarity, corresponding to *under* or *below*. This finding suggests that as EFL learners master prepositions, they navigate both L1 linguistic transfer and conceptual transfer, along with the complexities of L2 in understanding extended meanings. Specifically, L1 linguistic transfer involves the differences in expression between Chinese and English, as mentioned earlier. The complexity of L2 can be observed in the added dimension of contact in the meanings of *over* and *under*. Consequently, the challenging nature of extended meanings in vertical prepositions was corroborated by the findings of this study.

While there was no significant difference in the types of core meanings, a notable difference emerged in the types of extended meanings. This result suggests that core meanings are easier for learners to acquire, supporting Kaneko’s corpus findings^[13], which showed that learners master primary senses before extended ones. The difficulty in comprehending metaphorical meanings may be attributed to the abstract nature of extended meanings. Heine et al.’s scale of metaphorical abstraction and Lakoff and Johnson’s conceptual metaphor distinctions between upward and downward movements categorize two of the extended meanings in this study (quantity and status) under the QUALITY label^[28, 29]:

(35) PERSON > OBJECT > ACTIVITY > SPACE > TIME
> QUALITY

[28]

Thus, it is evident that overall, extended meanings are more abstract than core meanings. Winter notes that words conveying abstract concepts tend to be processed more slowly and are acquired later than words representing concrete concepts^[30–33]. The findings of this study align with this premise, indicating that the more abstract extended meanings pose challenges for EFL learners.

Regarding the acquisition order for EFL learners (Basic, Intermediate, and Advanced), statistical analysis revealed that *under* was the easiest to acquire, while *above*, *over*, and *below* presented a similar level of difficulty. The acquisition order of extended meanings among the prepositions was as

follows: $under_4 > above_4 = over_4 = below_4$. Additionally, the statistical results showed that the type effect was particularly prominent in the advanced and native groups. Advanced learners scored significantly higher on *under* compared to the other three prepositions, while native speakers demonstrated better understanding of *below* and *under* compared to *above* and *over*.

In summary, this study clearly indicates that EFL learners face difficulties in grasping extended meanings due to their abstract nature. However, as learners progress to the

advanced level, they begin to exhibit native-like performance in interpreting vertical prepositions, particularly in their comprehension of *under*.

5.3. Proficiency Effect

The results of the previous tasks show some correlation between the different proficiency groups compared to each other and the native control group. These findings are summarized in the **Table 15** and expanded upon.

Table 15. Comparison of native-like performance across EFL groups.

<p>Stage 1: (Basic)</p> <ol style="list-style-type: none"> 1. Being able to interpret the core meaning of the two prepositions (<i>over</i> and <i>under</i>) like the English natives 2. Being able to interpret the extended meaning (distance) of <i>above</i> and the extended meaning (status) of <i>over</i> like the English natives
<p>Stage 2: (Intermediate)</p> <ol style="list-style-type: none"> 1. Being able to interpret the core meaning of the three prepositions (<i>over</i>, <i>below</i> and <i>under</i>) like the English natives 2. Being able to interpret the extended meaning of the two prepositions (<i>above</i> and <i>over</i>) like the English natives 3. Being able to interpret the extended meanings (distance, number, and status) of <i>above</i>, <i>over</i>, and <i>under</i> and the extended meanings (number and status) of <i>below</i> like the English natives
<p>Stage 3: (Advanced)</p> <ol style="list-style-type: none"> 1. Being able to interpret the core meaning of the four prepositions like the English natives 2. Being able to interpret the extended meaning of the four prepositions like the English natives 3. Being able to interpret the extended meanings (distance, number, and status) of <i>above</i>, <i>over</i>, and <i>under</i> and the extended meanings (number and status) of <i>below</i> like the English natives

In the progression of EFL learners' understanding of prepositions' core and extended meanings across different proficiency levels, several distinct stages emerge. At the basic level, learners can comprehend the fundamental meanings of the four prepositions akin to native English speakers. This encompasses the core meanings of *over* and *under*, and the extended interpretations of *above* in terms of distance and *over* in terms of status. However, learners at the basic level did not have a good command of extended meanings of the four prepositions compared to natives.

Moving into the intermediate stage, learners deepen their understanding. They master the core meanings in line with native speakers and extend their grasp to include the abstract meanings of *above* and *over*. Furthermore, they begin to unravel the extended meanings of *above*, *over*, and *under* regarding distance, number, and status, along with the

extended meanings of *below* in terms of number and status.

As learners progress to the advanced level, their proficiency reaches a more comprehensive understanding. They proficiently interpret the core and extended meanings of all four prepositions akin to native English speakers. This stage involves a thorough grasp of the extended interpretations of *above*, *over*, and *under* regarding distance, number, and status, alongside the extended meanings of *below* in terms of number and status.

5.4. Interaction Effect

This study focused on two primary factors: the impact of type and proficiency. Specifically, the type effect was examined by analyzing both core and extended meanings, along with the effects of main types and subtypes. The results showed that only the extended meanings of preposition

types and the subtypes related to *above* had a significant influence on proficiency. This raises the question of which factor had the greatest impact on participants' acquisition of

vertical prepositions. **Table 16** presents the *p*-values from the interactions between proficiency and these two factors, as analyzed through a two-way ANOVA.

Table 16. Interaction between proficiency and the factors involved.

Interaction between proficiency and extended meaning preposition types 0.000418***	Interaction between extended meaning subtypes of above and proficiency 0.00113**
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Note. **p* < 0.05. ***p* < 0.01. ****p* < 0.001.

Table 16 highlights the significant effect of both factors on proficiency, with the extended meanings of preposition types exerting the greatest influence. This indicates that the extended meanings of the prepositions (*above*, *over*, *below*, and *under*) are the primary factor shaping EFL learners' comprehension of the four English vertical prepositions.

As learners advance to higher proficiency levels, their performance typically improves^[7, 8, 13, 19]. The advanced group's high accuracy in understanding the extended meanings of *under* aligns with the native group's comprehension of both *under* and *below*. This finding supports existing literature, which suggests that even among advanced L2 learners, similarities and differences in performance can coexist within their cognitive processing systems^[34, 35]. Specifically, the similarity lies in the mastery of the extended meanings of *under* by both advanced L2 learners and native speakers. However, the difference reflects varied perceptions, with advanced learners employing a dichotomous approach compared to the native speakers' trichotomous understanding of the extended meanings of these four prepositions.

6. Conclusions

This study investigated the comprehension of English prepositions among EFL learners, focusing on both core and extended meanings. By utilizing a diverse range of tasks and participant groups, the findings provide valuable insights into the challenges faced by learners at different proficiency levels, offering implications for language teaching.

The results indicate that both basic and intermediate learners struggled with the core meanings of *above* and *below*, suggesting the need for greater emphasis on these concepts in early instruction. Additionally, the acquisition of extended meanings, particularly for *below* and *under*, proved more difficult, underscoring the importance of focused instruction for these prepositions^[13]. Teachers are encouraged to

prioritize teaching extended meanings related to numerical concepts, such as distance and status, which are easier for learners to grasp^[36]. Native speakers' use of expressions like "superior to" and "lower than" also highlights the need to teach social hierarchy-related expressions. Interestingly, even native speakers showed subjective variation in preposition use, suggesting that contextualized teaching could help learners better grasp cognitive semantic concepts^[37] and develop a comparative understanding of prepositions rather than learning each one in isolation^[38]. In summary, teaching should focus first on core meanings, followed by extended meanings related to numerical concepts, and then more abstract notions like distance and status. These strategies offer practical insights for both teachers and curriculum designers in shaping second language acquisition.

The present study has several limitations and offers suggestions for future research. First, no significant performance differences were found between intermediate and advanced EFL learners across most tasks. To address this, future research could subdivide participants into high- and low-intermediate groups to explore potential differences at these levels. Additionally, expanding the participant pool to include learners from diverse academic backgrounds would improve the generalizability of the findings. Second, another limitation of the study was the reduction in the number of pictorial items due to concerns about visual ambiguity. Future research should include more unambiguous pictorial tasks to provide a more comprehensive assessment of core meaning acquisition. Furthermore, while the study used a Sentence Completion Task (SCT) with given options to reveal subtle differences between prepositions, this may have limited the exploration of L1 transfer effects. Future studies could use production tasks or remove the options to better analyze learners' natural responses and error patterns, offering deeper insights into L1 influence.

Author Contributions

Conceptualization, C.-Y.D.C.; Methodology, B.-H.R.W.; Software, B.-H.R.W.; Validation, C.-Y.D.C.; Formal analysis, C.-Y.D.C. and B.-H.R.W.; Investigation, B.-H.R.W.; Resources, C.-Y.D.C.; Data curation, B.-H.R.W.; Writing—original draft preparation, B.-H.R.W.; Writing—review and editing, C.-Y.D.C.; Visualization, B.-H.R.W.; Supervision, C.-Y.D.C.; Project administration, C.-Y.D.C.; Funding acquisition, C.-Y.D.C. Both authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

Ethical review and approval were waived for this study, as it involved only surveys and observations of public behavior, posing no more than minimal risk to participants.

Informed Consent Statement

Informed consent was obtained from all participants involved in this study.

Data Availability Statement

The data presented in this study are available on request from the corresponding author.

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Conflict of Interest

The authors declare no conflict of interest.

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