*3L: Language, Linguistics, Literature® The Southeast Asian Journal of English Language Studies*
*Vol 32(3), September 2026 http://doi.org/10.17576/3L-2026-3203-13*

# Cross-linguistic Influence of Image Schema and Family Resemblance in Chinese EFL Learners' Acquisition of *in* and *on*

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ABSTRACT

*Despite extensive research on conceptual transfer in L2 acquisition, Chinese EFL learners continue to struggle with 'in' and 'on'. Moreover, methodological challenges persist, and to date, few studies have systematically examined the cross-linguistic influence of image schema and family resemblance on Chinese EFL learners' acquisition of 'in' and 'on'. The present study addresses this gap by integrating a non-verbal task (picture-drawing, designed to elicit the categorisation of the containment and support image schemas) with verbal tasks (fill-in-the-blank and picture-description) to capture the linguistic manifestation of these categorisation patterns in learners' use of 'in' and 'on'. Fifty Chinese EFL learners completed an eight-item grammar test, with each item consisting of three tasks: fill-in-the-blank, picture-drawing, and picture-description. Two experimental items (car, boat) were designed to create conceptual mismatches, eliciting L1-specific categorisation patterns and predicted errors in the use of 'in' and 'on', while six control items targeted conceptual matches. The results reveal systematic error patterns reflecting the influence of mismatches in the containment and support image schemas, alongside high confidence in erroneous responses, which suggests limited awareness of these conceptual mismatches. These findings underscore the need for explicit instruction in cognitive restructuring of L2 spatial concepts through cognitive contrastive analysis rather than relying solely on semantic translation, and highlight the potential of visually grounded strategies, such as image schema diagrams and drawing-related tasks, to enhance learners' spatial reasoning and diagnostic assessment in authentic language use.*

*Keywords: cognitive linguistics; conceptual transfer; cross-linguistic influence; preposition acquisition; spatial conceptualisation*

## INTRODUCTION

Conceptual transfer has garnered increasing attention in second language (L2) acquisition (Jarvis, 2023; Park et al., 2022; Shin & Lease, 2025). Defined as cross-linguistic influence rooted in language-specific concepts and patterns of conceptualisation (Jarvis, 2023), conceptual transfer is theorised and analysed within the framework of the Conceptual Transfer Hypothesis (CTH). Numerous studies under the CTH framework have examined diverse cognitive domains, including space, time, motion, emotion, object, personhood, gender, and number (Alonso et al., 2016; Austen & Jarvis, 2021). Research on conceptual transfer among Chinese EFL learners has also

increased in recent years, encompassing both theoretical and empirical studies across various domains (Cai & Chang, 2021; X. Li, 2017; Liu & Chen, 2021; Qiu & Wen, 2020; Zhu, 2023).

Among the various cognitive domains examined in conceptual transfer, space constitutes a foundational one. Spatial relations are cognitively construed by humans and subsequently expressed through language, with each language providing multiple means to convey them. Drawing on Gestalt psychology, Talmy (1978) introduced the Figure-Ground principle, the Figure referring to the located object and the Ground to the reference object, to explain how spatial relations are perceived and categorised. Carlson (2000) and Levinson (2003) further emphasised that determining an object's position requires considering its relation to another object. The Figure-Ground distinction provides a foundational framework for understanding how spatial relations are encoded across languages. This underscores that Figure-Ground relations are not objectively given but must be actively construed by an observer, highlighting the intimate link between language and cognition (Becker & Carroll, 1997).

In English, spatial prepositions are among the most direct and frequently used lexical means of expressing Figure-Ground relations (Kennedy, 2014; Leech et al., 2014). Although frequently used and seemingly simple, they present considerable challenges for Chinese EFL learners, even at advanced proficiency levels (J. Li, 2019). According to the latest online *iWriteBaby Chinese Learner English Corpus*, prepositional errors account for 9% of all learners' errors, with *in* ranking as the most frequently misused preposition (10,250 occurrences), followed by *to* (6,365) and *on* (3,511).

Previous studies on the acquisition of *in* and *on* have primarily focused on semantic transfer. According to Tyler and Evans (2003), *in* encodes a relation of containment, while *on* represents support. Wu and Wei (2007) demonstrated that, based on a comparison of their definitions, the Chinese spatial words *li* and *shang* correspond respectively to the English prepositions *in* and *on* in encoding the relations of containment and support. However, this correspondence is inconsistent: when the Ground is a two-dimensional area, Chinese allows both *li* and *shang*, whereas English uses only *in* (Wu & Wei, 2007); moreover, the semantic scope of *shang* can extend to cover both *in* and *on* (Ma, 2007). The semantic relations between *li* and *shang* versus *in* and *on* are therefore characterised by intersection and non-correspondence. This intersecting nature makes it both feasible and meaningful to investigate *in* and *on* together. The semantic mismatches result in prepositional errors, suggesting underlying conceptual mismatches and the need for a deeper examination of cross-linguistic differences in concepts and conceptualisation patterns (X. Li, 2017; H. Zhang & Liu, 2013).

Recent empirical studies on conceptual transfer in the acquisition of English prepositions indicate that cross-linguistic similarities lead to positive conceptual transfer and facilitate learning, whereas cross-linguistic differences give rise to negative transfer and result in prepositional errors (Xu, 2015; S. Zhang & Luo, 2017). To understand how conceptual transfer manifests in the acquisition of *in* and *on*, it is essential to examine the cognitive patterns underlying these spatial prepositions. From a cognitive linguistics perspective, the English prepositions *in* and *on* instantiate the containment and support image schemas, respectively (Lakoff, 1987). Importantly, from the perspective of Prototype Theory (Rosch, 1973), these schematic categories are not all-or-nothing categories, with each extending from prototypical to peripheral instances through the principle of family resemblance, which plays a key role in the formation of category prototypes and in the gradient of category membership (Ungerer & Schmid, 2013). Consequently, Chinese learners may need to restructure the L2 categorisation patterns rather than simply mapping their Chinese (L1) categorisation patterns of the containment and support image schemas onto L2.

Accordingly, examining how cross-linguistic differences in image schema and family resemblance affect Chinese EFL learners' acquisition of *in* and *on* offers a new lens for investigating conceptual transfer.

Although extensive research has been conducted on the acquisition of English spatial prepositions, the high error rate reveals that Chinese EFL learners face persistent difficulties with *in* and *on*. Prepositional errors arise from cross-linguistic differences in concepts and conceptualisation patterns (Xu, 2015), yet the mechanisms underlying conceptual transfer in the acquisition of *in* and *on* remain underexplored, largely due to persistent methodological challenges. Much of the existing evidence relies on inferences from verbal data, without direct evidence of learners' concepts and conceptualisation patterns (Pavlenko, 2009), leading to a frequent conflation of semantic transfer with conceptual transfer (Jarvis & Pavlenko, 2008; Odlin, 2005). While previous studies have attributed Chinese EFL learners' persistent difficulties with *in* and *on* to semantic mismatches (Ma, 2007; Wu & Wei, 2007), whether conceptual mismatches in containment and support image schemas systematically influence prepositional accuracy remains unclear.

To address this research gap, the present study examined the cross-linguistic influence of image schema and family resemblance using an 8-item grammar test, which included six control items (conceptual matches in the categorisation of the containment and support image schemas) and two experimental items (conceptual mismatches in this categorisation). To capture both categorisation patterns and linguistic manifestation, participants completed a non-verbal drawing task and two verbal tasks (a fill-in-the-blank task and a picture-description task), allowing for a triangulated analysis of conceptual transfer.

This study addresses the following research questions:

1. Do Chinese EFL learners exhibit conceptual mismatches in their categorisation of containment and support image schemas?
2. How do mismatches in image schema and family resemblance affect their accuracy in the use of *in* and *on*?

## LITERATURE REVIEW

### CONCEPTUAL TRANSFER HYPOTHESIS AND PROTOTYPE THEORY

The Conceptual Transfer Hypothesis (CTH) and Prototype Theory constitute the theoretical foundation of this study. CTH, proposed by Pavlenko (1998) and Jarvis (1998), suggests that cross-linguistic differences in conceptual categories and structures lead to variations in conceptualisation patterns, which may transfer across languages and influence bilinguals' or L2 learners' use of both their L1 and L2 (Bylund & Jarvis, 2011). If language A influences an individual's cognition, this cognition will, in turn, influence their use of language B (Jarvis, 2007). Central to this hypothesis are concepts and conceptualisation. Concepts refer to mental representations of categories composed of images, impressions, or image schemas acquired through perception (Lakoff, 1987; Murphy, 2002). Conceptualisation refers to the dynamic cognitive processes that activate these concepts and shape how individuals engage with the world (Jarvis & Pavlenko, 2008; Langacker, 2008). Conceptual transfer, including concept transfer and conceptualisation transfer, can be positive or negative, and forward (L1→L2), backward (L2→L1), or mutual. This study specifically focuses on forward conceptual transfer (L1→L2) in the domain of space.

To understand how concepts, particularly the containment and support image schema, are internally structured, this study also draws on Prototype Theory. Prototype Theory (Rosch, 1973, 1978) provides a cognitive framework for understanding how humans categorise entities based on prototypical members rather than fixed sets of necessary features. Category membership is not an all-or-nothing matter but involves varying degrees of typicality (Ungerer & Schmid, 2013), as categories are organised around central cases, or prototypes, with other members exhibiting graded membership based on their family resemblance (Rosch & Mervis, 1975), the principle that each member shares one or more features with at least one other member. Cultural experience further shapes category formation, leading to cross-linguistic differences in typicality judgments and category membership.

Complementing the CTH, which explains the source and direction of conceptual transfer, Prototype Theory accounts for the internal structure of image schemas: how categories like containment and support are organised around prototypical cases and extended to peripheral ones via family resemblance. Together, these two theories offer a complementary lens for examining whether and how the L1-based image schema and family resemblance shape Chinese EFL learners' categorisation patterns and subsequent acquisition of English prepositions *in* and *on*.

## LINGUISTIC ENCODING OF FIGURE-GROUND RELATIONS

Although English and Chinese both utilise the Figure-Ground framework in representing spatial relations, they differ in their linguistic encoding (X. Li, 2017). English primarily encodes Figure-Ground relations using prepositions (e.g., *on the table*, *in the room*), whereas Chinese encoding is more complex and can be realised in three ways (Zhou, 2011). The most common structure is a frame construction: the preposition *zai* indicates the spatial relation, followed by a spatial word specifying dimensional information (e.g., *zai zhuozi shang* meaning '*on the table*', *zai wu li* meaning '*in the room*'). Alternatively, *zai* may be omitted, leaving the spatial word after the noun (e.g., *zhuozi shang*, *wu li*), or the spatial word may be omitted, with *zai* alone conveying the relation (e.g., *zai chezhan* meaning '*at the station*', *zai jiudian* meaning '*at the hotel*').

Beyond encoding differences, English and Chinese also diverge in their dimensional judgments of Figure-Ground relations (X. Li, 2017). English categorises spatial prepositions according to the dimensional characteristics of the reference object (Ground) relative to the located object (Figure) (Quirk et al., 1985): Dimension 0 (point) uses *at*, *to*, *from*; Dimension 1/2 (line/surface) uses *on*, *onto*, *off*; and Dimension 2/3 (area/volume) uses *in*, *into*, *out of*. For instance, *on* can indicate a line (*on the boundary*) or a surface (*on the table*), while *in* marks a bounded area (*in the playground*) or a volume (*in the bag*). In contrast, a single Chinese spatial word *shang* can express multidimensional relations across these categories, as in *bianjie shang* (*on the boundary*), *zhuozi shang* (*on the table*), and *caochang shang* (*in the playground*). Similarly, *zai* alone can convey different dimensional relations without additional spatial specification, e.g., *zai jichang* (*at the airport*) and *zai tushuguan* (*in the library*) (Wu & Wei, 2007). Although Chinese speakers are aware of abstract geometric distinctions such as point, line, surface, area, and volume, they place greater emphasis on whether an object falls within a relevant spatial range. Consequently, Chinese tends to adopt a classification of Figure-Ground relations that is more pragmatic and less constrained by abstract geometric criteria (Qi, 1998). This is reflected in the use of three primary spatial categories, *li* (interior), *shang*, and *wai* (exterior), rather than the fine-grained geometric distinctions found in English.

The observed differences in linguistic encoding and dimensional judgments between English and Chinese suggest broader cross-linguistic differences in concepts and patterns of conceptualisation underlying Figure-Ground relations. The present study focuses specifically on how these differences manifest in the categorisation of the containment and support image schemas, thereby influencing the use of *in* and *on*.

Image-schematic Idealised Cognitive Models (ICMs), proposed by Lakoff (1987), serve as a framework for revealing spatial configurations of Figure-Ground relations. An image schema captures schematic patterns related to the location, shape, and movement of an entity, comprising three core components: trajector (TR, corresponding to the Figure), landmark (LM, corresponding to the Ground), and path (the spatial route or region indicating the TR's direction and extent) (Langacker, 1987).

The image schema underlying *in* involves a trajector that is either partially or fully enclosed by the landmark, and the trajector may be either moving or stationary. In contrast, *li* denotes a trajector situated within an interior space, and this trajector may also be moving or stationary (H. Zhang & Liu, 2013). The image schemas underlying *in* and *li* are illustrated in Figures 1 and 2, respectively.

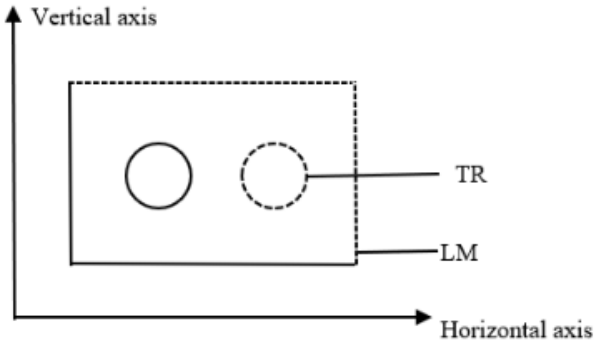


FIGURE 1. The image schema underlying *in* (adapted from H. Zhang & Liu, 2013)

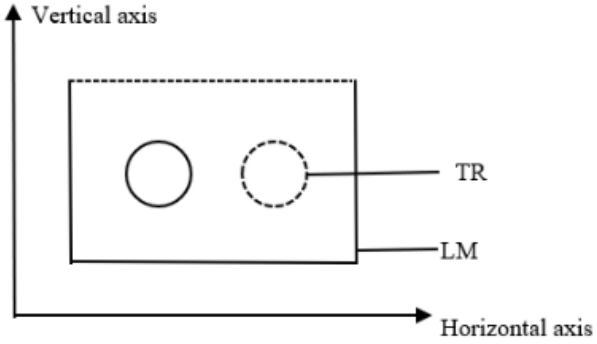


FIGURE 2. The image schema underlying *li* (adapted from H. Zhang & Liu, 2013)

Cross-linguistic similarities in the containment image schema lie in the trajector being located in a container-like landmark that is hollow, closed, and materially bounded, and this configuration constitutes a prototype in both English and Chinese (Xu, 2015). Cross-linguistic differences concern the degree of enclosure: *in* allows the trajector to be either fully or partially enclosed, whereas *li* typically profiles a trajector situated within an interior space that has more clearly material boundaries. This suggests that the conceptual category of *li* is narrower than that of *in*, consistent with H. Zhang and Liu's (2013) findings.

The image schema underlying *on* involves the trajector being attached to the landmark and exerting pressure on it, while the landmark provides support for the trajector. The trajector remains fully exposed and may be moving or stationary (Talmy, 2000). In contrast, the image schema underlying *shang* contains a broader scope: *shang* involves a trajector being located on or above the landmark, and the trajector may or may not be attached to the landmark, be moving or stationary, and be fully exposed or partially embedded in the landmark (H. Zhang & Liu, 2013). The image schemas underlying *on* and *shang* are illustrated in Figures 3 and 4, respectively.

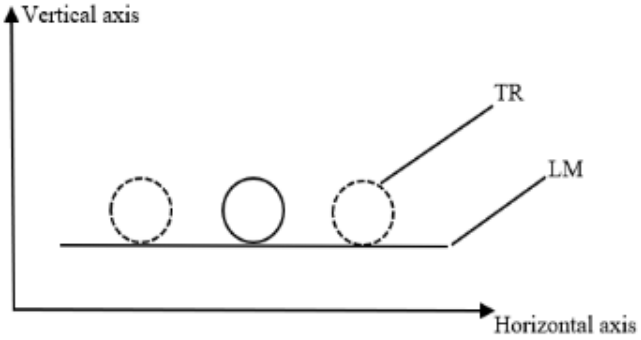


FIGURE 3. The image schema underlying *on* (adapted from H. Zhang & Liu, 2013)

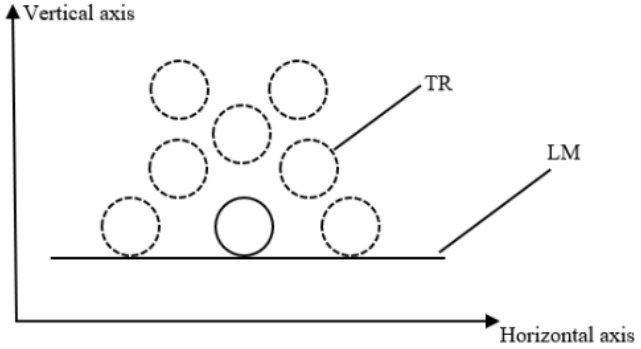


FIGURE 4. The image schema underlying *shang* (adapted from H. Zhang & Liu, 2013)

Cross-linguistic differences in the support image schema lie in the requirement that *on* entails the trajector being in contact with the landmark and fully exposed, whereas these attributes are not obligatory for *shang*. In other words, the conceptual category of *shang* is broader than that of *on,* consistent with H. Zhang and Liu's (2013) finding.

The image schemas underlying *in* and *on* form a gradation from prototypical to peripheral instances based on abstract geometric criteria (Wu & Wei, 2007), as intuitively visualised in Figure 5. The left end of the scale (a) represents the most prototypical containment, where the use of *in* is most acceptable, whereas the right end of the scale (h) represents the most prototypical support, where the use of *on* is most acceptable.

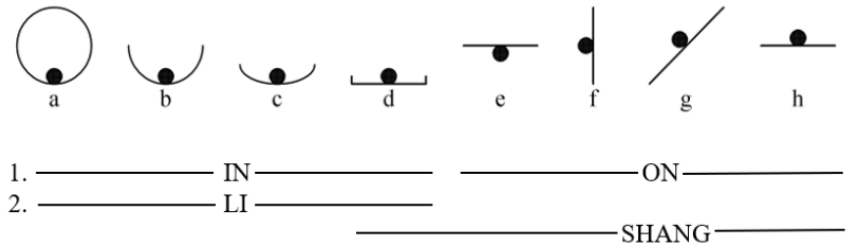


FIGURE 5. An intuitive visualisation of spatial relations: *in* and *on* vs *li* and *shang* (adapted from Wu & Wei, 2007)

The image schemas underlying *li* and *shang* operate on a continuum from *li* (interior) to *shang* (Ge, 2004), as intuitively visualised in Figure 6, where the boundaries between the two are fuzzy and not clearly defined. Configuration (d) in Figure 5 represents the least prototypical containment, marking the intersection between *li* and *shang* where these image schemas overlap, allowing interchangeable use in some contexts where English requires *in* (Wu & Wei, 2007).

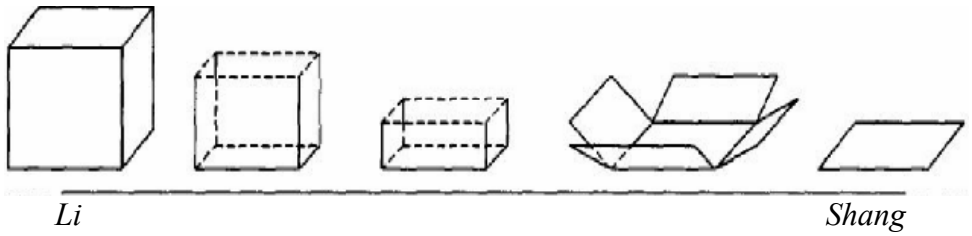


FIGURE 6. Image Schema Continuum from *li* to *shang* (adapted from Ge, 2004)

## MISMATCHES BETWEEN L1 AND L2 IN THE CONTAINMENT AND SUPPORT IMAGE SCHEMAS

Mismatches between L1 and L2 in the containment and support image schemas occur when the Ground can simultaneously provide an interior space and a supporting surface. As illustrated in Figure 7, when the Ground is a two-dimensional area, it falls within the image schema underlying *in* and also belongs to the image schemas underlying *li* and *shang*. *Li* emphasises the interior space, while *shang* emphasises the supporting surface (X. Li, 2017). This flexibility is expected to give rise to negative conceptual transfer in Chinese EFL learners' categorisation of the containment and support image schemas, thereby influencing their use of *in* and *on*.

FIGURE 7. The image schema of *in* and *shang* (adapted from X. Li, 2017)

These mismatches are obvious in the boat context, which simultaneously provides an interior space and a supporting surface, and can therefore be construed as either *li* (containment) or *shang* (support) in Chinese. In English, however, the choice between *in* (containment) and *on* (support) is constrained by functional-geometric criteria. L1 allows interchangeable use and conceptual flexibility, whereas L2 is strictly based on abstract geometric distinctions. This cross-linguistic difference creates uncertainty for Chinese EFL learners, particularly in picture-drawing tasks that require explicit categorisation of the image schema.

This distinction is supported by Jackendoff's (1992) observation that small vehicles (such as cars, rowboats, and small planes) are typically perceived only as containers in English, whereas large vehicles (such as coaches, yachts, and large aeroplanes) can be conceptualised either as containers or as supporting surfaces, depending on their functional role and geometric properties.

These mismatches involving cars can be explained by family resemblance. Although car is prototypically a container in both languages, it is categorised with boat as a vehicle in Chinese. Both vehicles provide an interior space and a surface regardless of the size, and allow the flexible use of *li* and *shang*. Because boat can be construed as support, learners may extend to car via family resemblance.

## PREVIOUS RESEARCH ON CONCEPTUAL TRANSFER IN L2 ACQUISITION OF SPATIAL PREPOSITIONS

Previous research outside China has provided substantial evidence for conceptual transfer in L2 acquisition of English spatial prepositions. Alonso et al. (2016) found that L1 conceptual patterns influenced Danish and Spanish learners' use of *in*, *on*, and *at*, supporting cognitive linguistic approaches to L2 instruction. Taferner and Yamada (2020) demonstrated that Japanese learners' difficulties with *in* and *on* stem from cross-linguistic differences in image schema and family resemblance within Figure-Ground configurations. Chuang (2020) used a word-choice task with conceptually congruent and incongruent stimuli and found a significant effect of L1 conceptual transfer on L2 accuracy, with proficiency moderating performance. Collectively, these studies highlight the need for targeted investigations of how L1 spatial categorisation influences L2 preposition use, which is echoed by Jarvis's (2023) call for further empirical research into the cognitive mechanisms underlying conceptual transfer.

In the Chinese EFL context, research has confirmed the existence of conceptual transfer but has provided little direct evidence of the conceptual patterns that underlie it. S. Zhang and Luo (2017) applied Image Schema Theory to learner corpus data, finding that prepositional errors primarily resulted from negative transfer driven by cognitive differences between L1 and L2. Similarly, X. Li (2017) found that cognitive differences in spatial relations caused negative transfer in the acquisition of *at* and *on*, while *in* showed minimal negative transfer. Q. Li (2023) further revealed that conceptual similarities and high input frequency facilitated acquisition, with frequency moderating negative transfer. However, these studies infer cognitive differences indirectly from linguistic output alone, rather than providing direct evidence from learners' conceptual patterns. Thus, while previous research has confirmed the existence of conceptual transfer among Chinese EFL learners, direct evidence from learners' categorisation patterns remains largely absent.

To address this gap, the present study integrates non-verbal and verbal tasks to investigate how mismatches in image schema and family resemblance influence Chinese EFL learners' acquisition of *in* and *on*. By directly eliciting learners' categorisation of the containment and support image schemas and their linguistic output, it aims to provide direct non-verbal evidence of conceptual transfer and to offer pedagogical insights for more effective English instruction.

## METHODOLOGY

The present study adopted a quantitative research design adapted from Taferner and Yamada (2020), whose test design has been validated in previous research for its effectiveness in capturing conceptual transfer. This design is methodologically motivated by the argument that non-verbal tasks can provide direct evidence of learners' conceptualisation patterns, while verbal tasks capture their linguistic manifestation (Jarvis, 2016; Jarvis & Pavlenko, 2008). Pictures, in particular, have been extensively used to elicit non-verbal evidence of spatial conceptualisation (e.g., Alonso et al., 2016; Chuang, 2020; Taferner & Yamada, 2020). Triangulating these two types of data thus allows for a more comprehensive investigation of conceptual transfer than either method alone.

### PARTICIPANTS

Participants were recruited from a university in Anhui Province, China, via a background survey administered online through *Wenjuanxing*, a widely used survey platform in China, to collect personal and educational information for controlling external variables. To ensure disciplinary diversity, participants were purposively sampled from the Schools of Business, Law, Physics, and Computer Science. These four schools share consistent EFL curricula, textbooks, and teaching approaches, ensuring a comparable English learning context and thereby strengthening the study's internal validity. All were native Mandarin speakers with no overseas study experience and had received over ten years of formal English instruction exclusively in the Chinese EFL context.

Based on their scores on the College English Test (CET) Band 4 and CET-6 and years of formal English instruction, 150 first-, second-, and third-year non-English majors were classified into three proficiency levels: high-level had a CET-6 score of 425 or above; intermediate-level had passed CET-4 (≥425) but either had not taken CET-6 or scored below 425 on it; low-level scored below 425 on CET-4. From the intermediate- and high-level groups, 50 participants (25 females, 25 males; aged 18–21) were randomly selected for the main test. 50 participants were recruited to ensure adequate statistical power while maintaining feasibility. All 50 had passed the CET-4 (minimum passing score = 425), with an average score of 570.3 (SD = 46.8), suggesting that observed errors were more likely to reflect cross-linguistic conceptual transfer rather than general language limitations. All participants provided written informed consent and received small gifts upon completion.

### INSTRUMENTS

The grammar test included eight items adapted from the design of Taferner and Yamada (2020). The adaptation was informed by conceptual mismatches in the containment and support image schemas in vehicle contexts between English and Chinese. The instruments were validated by three experts in EFL education.

The test comprised six control items (plate, cage, bowl, penholder, jar, table) and two experimental items (car, boat). Control items represented image schemas shared by both languages and were expected to pose minimal difficulty. Experimental items represented contexts where categorisation differs cross-linguistically: car targeted family resemblance effects, while boat targeted both containment and support image schemas. These constructs of image schema and family resemblance were operationalised through a non-verbal drawing task and two verbal tasks (fill-in-the-blank and picture-description). The drawing task elicited visual representations of the targeted image schemas, while the verbal tasks captured how these schemas were encoded linguistically.

For each item, participants completed three tasks: a fill-in-the-blank task, a picture-drawing task, and a picture-description task. In the fill-in-the-blank task, participants completed the sentence pattern "*Can you see the figure* ___ *the ground*?" and rated their confidence on a 5-point scale (1 = 0%–20%, 2 = 21%–40%, 3 = 41%–60%, 4 = 61%–80%, 5 = 81%–100%). In the picture-drawing task, participants drew the Figure-Ground relation in boxes next to each sentence, following a brief sketch-drawing training to ensure consistent representations. The picture-drawing section was detached after completion and returned one week later. In the picture-description task, participants wrote descriptions of their drawings in Chinese to minimise L2 interference.

Three experienced EFL instructors, blind to participants' responses, independently rated the drawings based on operational definitions, whereby containment was coded when the Figure was depicted inside a bounded enclosure, and support when the Figure was depicted on the surface. The majority label was used as the final classification.

## DATA ANALYSIS

For the 8-item grammar test, responses were scored dichotomously: 1 point was awarded only when the preposition choice, picture-drawing, and picture-description were all accurate and consistent; otherwise, 0 points. The picture-drawing task achieved high inter-rater reliability (96.7% agreement) among the three raters; discrepancies were resolved through discussion.

Chi-square ($\chi^2$) tests were performed to compare accuracy between control and experimental items, followed by post-hoc pairwise comparisons with Bonferroni correction. To examine participants' performance on the two experimental items, a cross-tabulation of responses to Item 5 (car) and Item 8 (boat) was generated. For the error pattern analysis, a response was coded as ungrammatical when the preposition selected by the participant did not correspond to the image-schematic configuration of Figure-Ground relations in the picture-drawing task. An analysis of error patterns for these two items was then performed to investigate how conceptual mismatches influence learners' accuracy in the use of *in* and *on.*

# RESULTS

Table 1 presents correct *in*/*on* responses and associated confidence levels across all test items, with learners reporting high confidence (a self-rating of 4 or above on a 5-point scale) even for incorrect responses. A Pearson chi-square ($\chi^2$) test was employed to examine differences in participants' accuracy across the eight test items. Results (see Table 2) showed a significant difference in accuracy across items, $\chi^2$ (7, N = 400) = 127.18, $p < .001$. The six control items (1, 2, 3, 4, 6, and 7) showed correct response rates ranging from 94% to 100%. The two experimental items yielded

lower accuracy: Item 5 (car context) showed a correct rate of 82%, and Item 8 (boat context) produced the lowest correct rate of 40%. Post-hoc pairwise comparisons (Bonferroni-corrected α = .0167) revealed that the boat item differed significantly from both the control items and the car item, and the car item also differed significantly from the control items (all ps < .001).

TABLE 1. Correct *in/on* responses and associated confidence levels for test items (N=50)

| Test sentences | Response (Mean %) | Confidence level Mean (SD) |
|---|---|---|
| 1. Can you see 3 apples ___ the plate? | 96% (48/50) | 4.02 |
| 2. Can you see a bird ___ the cage? | 96% (48/50) | 4.18 |
| 3. Can you see oranges ___ the bowl? | 94% (47/50) | 4.04 |
| 4. Can you see pens ___ the penholder? | 100% (50/50) | 4.16 |
| 5. Can you see Tom ___ the car? | 82% (41/50) | 4.06 |
| 6. Can you see candies ___ the jar? | 98% (49/50) | 4.10 |
| 7. Can you see a cup ___ the table? | 96% (48/50) | 4.20 |
| 8. Can you see Jackie ___ the boat? | 40% (20/50) | 4.00 |

Correct prepositions: 1 (*on*); 2 (*in*); 3 (*in*); 4 (*in*); 5 (*in*); 6 (*in*); 7 (*on*); 8 (*in*/*on*)

TABLE 2. Chi-Square Test of Correct Response Rates Across Eight Test Items

| Test | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| Pearson Chi-Square | 127.18 | 7 | < .001 |
| Likelihood Ratio | 98.19 | 7 | < .001 |
| Linear-by-Linear Association | 40.02 | 1 | < .001 |
| N of Valid Cases | 400 | | < .001 |

Note: 0 cells (0.0%) have expected count less than 5. Minimum expected count = 6.25.

As shown in the cross-tabulation of responses to item 5(car) and item 8 (boat) in Table 3, 20 participants (40%) answered both the car item and the boat item correctly. A total of 21 participants (42%) answered the car item correctly but the boat item incorrectly. No participant answered the boat item correctly while answering the car item incorrectly. The remaining 9 participants (18%) answered both items incorrectly.

TABLE 3. Cross-Tabulation of Responses to Item 5 (Car) and Item 8 (Boat)

| | Boat (Correct) | Boat (Incorrect) | Total |
|---|---|---|---|
| Car (Correct) | 20 | 21 | 41 |
| Car (Incorrect) | 0 | 9 | 9 |
| Total | 20 | 30 | 50 |

As shown in Table 4, participants responded differently to the car and boat items. For the car item (target: *in*), 82% of participants used *in*, while 18% selected *on*. For the boat item (both *on* and *in* were accepted as correct), 74% selected *on*, while 26% selected *in*.

Further analysis of response patterns for Items 5 (*Can you see Tom __ the car*?) and 8 (*Can you see Jackie __ the boat*?) was conducted. Only five patterns appeared in the data: *in-in*, *in-on*, *in-*in*, *in-*on*, and **on-*on*, where the first element refers to Item 5 (car), the second to Item 8 (boat). An asterisk (*) denotes an ungrammatical response. Table 4 also presents the percentages of these patterns along with their average confidence levels. As shown in the table, the *in-in* pattern was associated with the highest confidence (M = 4.3), whereas error patterns such as **on-*on* were associated with a slightly lower confidence (M = 4.0).

Three error patterns were identified: *in*-**in* (12%), *in*-**on* (30%), and **on*-**on* (18%). For the car item (**on*-**on*, 18%), participants consistently selected *on*, yet their picture-drawings depicted containment (i.e., Tom inside the car), revealing a mismatch between prepositional choice and conceptual representation. For the boat item, the picture-drawing data further revealed that in the *in*-**in* pattern (12%), participants selected *in* but drew support (e.g., Jackie on the boat deck), indicating a mismatch. In the combined *in*-**on* and **on*-**on* patterns (48%), participants selected *on* but drew containment (e.g., Jackie inside the boat), reflecting a more prevalent mismatch.

TABLE 4. Response patterns for *Tom the car* and *Jackie the boat* with confidence levels

| Response Pattern | *in-in* | *in-on* | *in-*in* | *in-*on* | **on-*on* |
|---|---|---|---|---|---|
| Percentage (%) | 14 | 26 | 12 | 30 | 18 |
| Confidence Level | 4.3 | 4.2 | 4.0 | 4.1 | 4.0 |

## DISCUSSION

Chinese EFL learners exhibit conceptual mismatches in their categorisation of containment and support image schemas. The accuracy hierarchy observed (control items > car > boat) establishes a clear pattern: Chinese EFL learners' difficulties with *in* and *on* are not uniform but vary systematically with the degree of cross-linguistic conceptual mismatches. The near-ceiling performance on control items indicates that conceptual matches in the categorisation of containment and support image schemas facilitate prepositional acquisition (Chuang, 2020). For experimental items, the lower accuracy reflects cross-linguistic mismatches, which operate through two distinct mechanisms: the influence of L1 image schema on the boat item, and L1 family resemblance on the car item. These findings confirm that conceptual mismatches arising from L1 image schema and family resemblance systematically influence Chinese EFL learners' accuracy in the use of *in* and *on*.

The error patterns illustrate how mismatches in image schema and family resemblance contribute to errors in the use of *in* and *on*. For the car (Item 5), although it is a prototypical container in both languages, Chinese EFL learners occasionally produced non-target-like expressions such as *on the car*. The cross-tabulation reveals that these errors are systematic rather than random: 18% of participants who made errors on both items demonstrate a mismatch, with the car classified into the same 'vehicle' category as the boat through family resemblance, triggering the transfer of *on* from boat to car. Crucially, all of the participants drew containment (e.g., Tom inside the car) while producing *on the car* (*che shang*), revealing a conceptual mismatch between their prepositional choice and their drawn representation. The fact that no participant made errors on the car alone (0%) further confirms that the influence is from the boat to the car, not the reverse. This influence of family resemblance is consistent with Taferner and Yamada (2020).

For boat, although learners used both *in* and *on*, the frequency of *on the boat* (74%) was significantly higher than that of *in the boat* (26%), largely due to the influence of the conventional Chinese expression *(zai) chuan shang*. Picture-drawing task analysis revealed a significant mismatch between linguistic choice and conceptual representation: 48% of the picture-drawings accompanying *on-the-boat* responses drew containment, whereas only 12% of those accompanying *in-the-boat* responses drew support. For instance, Case 12 (Figure 8) selected *on* for boat, yet her drawing clearly depicted Jackie as being inside the boat, revealing a mismatch

between preposition choice and underlying image schema. Conversely, Case 17 (Figure 9) selected *in* for boat, yet her drawing clearly depicted Jackie as being on the boat deck. Together, these patterns provide direct evidence that errors on boat stem from the influence of the L1 categorisation of the image schema rather than mere lexical confusion.

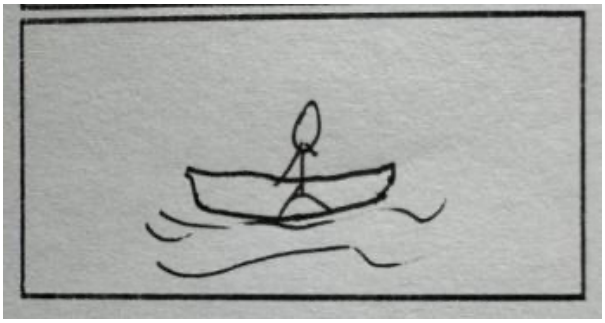

FIGURE 8. Case 12's Picture-drawing

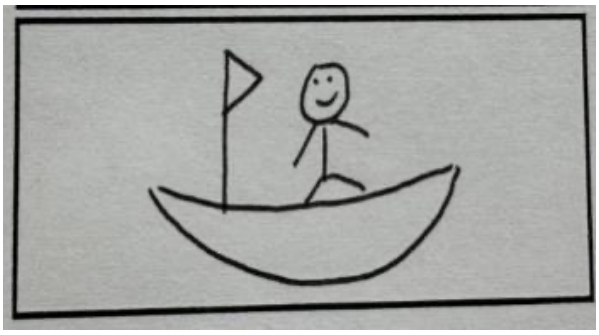

FIGURE 9. Case 17's Picture-drawing

These findings provide further support for the CTH. Moreover, by integrating a non-verbal picture-drawing task, the present study offers more direct evidence at the conceptual level than previous research that relied solely on learners' linguistic output (e.g., X. Li, 2017; S. Zhang & Luo, 2017). The picture-drawing task effectively elicited categorisation patterns that were not accessible through linguistic output alone, revealing systematic mismatches between learners' prepositional choices and their underlying image-schematic construals.

The notably high confidence accompanying errors suggests that learners had limited awareness of their conceptual errors, reflecting the automatic, unconscious influence of entrenched L1 image schemas that persist despite relatively high English proficiency. This indicates that L1-based conceptualisation patterns were not effectively suppressed, highlighting the need for instructional interventions that promote L2 cognitive restructuring rather than merely enhancing metalinguistic knowledge.

Pedagogically, these findings on prepositional errors underscore the need to move preposition instruction beyond semantic translation, since explaining *shang* as equivalent to *on* or *li* as equivalent to *in* fails to capture their conceptual mismatches. Conversely, traditional instruction based on meaning explanation may exacerbate learning difficulties, precisely due to the intersecting yet non-corresponding mapping between the L1 spatial words and English prepositions. Integrating cognitive contrast into preposition instruction enables learners to

understand the linguistic motivations underlying spatial constructions (Tyler & Evans, 2003), clarifies cross-linguistic conceptual differences, and assists in the development of new conceptual systems (Qiu & Wen, 2020). This application of cognitive linguistics to English instruction has been well documented in empirical studies (e.g., Lahlou & Rajandran, 2025). This enables learners to understand not only the "what" but also the "why" of target language use. To this end, visually supported strategies, such as image schema diagrams, VR-enhanced animations, and context-rich tasks, can aid learners in internalising L2-specific spatial patterns, while the picture-related task can serve as a diagnostic tool to reveal learners' underlying conceptual representations (Jarvis & Pavlenko, 2008), thereby informing more targeted instructional approaches.

## CONCLUSION

English spatial prepositions may seem simple and limited in number, but cross-linguistic differences in image schema and family resemblance make them particularly challenging for L2 learners (Taferner & Yamada, 2020). These conceptual mismatches are especially evident in the categorisation of containment and support schemas, where the spatial concepts between L1 and L2 do not always align. This study demonstrates how Chinese EFL learners' use of *in* and *on* is influenced by L1-based categorisation of these image schemas, and provides empirical evidence through a novel combination of fill-in-the-blank, picture-drawing, and picture-description tasks. As prepositional errors stem from deep-rooted conceptual differences (X. Li, 2017) rather than superficial grammatical issues, raising learners' awareness of cross-linguistic spatial conceptualisation is crucial for effective instruction.

Several limitations should be acknowledged. First, the study was conducted at a single university in Anhui Province, China, limiting the generalisability of the findings. Future research should include learners from multiple institutions and diverse geographic regions. Second, the study excluded low-proficiency learners to ensure task validity, which limits the generalisability of the findings to the broader EFL population. Future research should include lower-proficiency learners in similar conceptualisation tasks to investigate whether the observed transfer patterns emerge at early stages of L2 acquisition. Third, the study focused exclusively on the English prepositions *in* and *on* and the corresponding Chinese spatial words *li* and *shang*, restricting its scope to their core spatial meanings and excluding temporal and metaphorical extensions. Future research should investigate whether the same patterns of conceptual transfer apply to other spatial prepositions (e.g., *above*, *over*, *under*, *beside*) or extend to other cognitive domains (e.g., time, object, motion).

## REFERENCES

Alonso, R., Cadierno, T., & Jarvis, S. (2016). Crosslinguistic influence in the acquisition of spatial prepositions in English as a foreign language. *Crosslinguistic Influence in Second Language Acquisition*, 95, 93–120. https://doi.org/10.21832/9781783094837-008

Austen, S., & Jarvis, S. (2021). Conceptual meaning in Italian-speaking learners' expression of temporality in L2 English. *Journal of Second Language Studies, 4*(1), 121–153. https://doi.org/10.1075/jsls.19016.aus

Becker, A., & Carroll, M. (1997). *The acquisition of spatial relations in a second language*. John Benjamins.

Bylund, E., & Jarvis, S. (2011). L2 effects on L1 event conceptualization. *Bilingualism: Language and Cognition,* 14(1), 47–59. https://doi.org/10.1017/S1366728910000180

Cai, J., & Chang, H. (2021). Theoretical and methodological frameworks for research on conceptual transfer. *Foreign Language Teaching and Research*, *53*(5), 707–719. https://doi.org/10.19923/j.cnki.fltr.2021.05.006

Carlson, L. A. (2000). Object use and object location: The effect of function on spatial relations. In E. Zee & N. Urpo (Eds.), Cognitive interfaces: *Constraints on linking cognitive information* (pp. 94-115). Oxford University Press.

Chuang, H.-J. (2020). How do cross-linguistic similarities and differences affect the mapping of spatial relationships, containment, and support in L2? *Chinese as a Second Language Research*, *9*(1), 67–88. https://doi.org/10.1515/caslar-2020-0003

Ge, T. (2004). A cognitive analysis of "shang" and "li" *Journal of the School of Chinese Language and Culture, Jinan University, 1,* 59–68.

Jackendoff, R. (1992). *Languages of the mind: Essays on mental representation*. MIT Press.

Jarvis, S. (1998). *Conceptual transfer in the interlingual lexicon.* Indiana University Linguistics Club Publications.

Jarvis, S. (2007). Theoretical and methodological issues in the investigation of conceptual transfer. *Vigo International Journal of Applied Linguistics*, *4*, 43–71.

Jarvis, S. (2016). Clarifying the scope of conceptual transfer. *Language Learning*, *66*(3), 608-635. https://doi.org/10.1111/lang.12154

Jarvis, S. (2023). Conceptual transfer: Roots, assumptions, and current scope. *Language, Interaction and Acquisition*, *14*(1), 14–40. https://doi.org/10.1075/lia.22011.jar

Jarvis, S., & Pavlenko, A. (2008). *Crosslinguistic influence in language and cognition.* Routledge.

Kennedy, G. (2014). *An introduction to corpus linguistics*. Routledge.

Lahlou, H., & Rajandran, K. (2025). Conceptual metaphors of time in Malaysian English textbooks: A comparative cognitive linguistic study. *3L: Language, Linguistics, Literature*, *31*(1), 1 – 18. https://doi.org/10.17576/3L-2025-3103-26

Lakoff, G. (1987). Image metaphors. *Metaphor and Symbol*, *2*(3), 219–222. https://doi.org/10.1207/s15327868ms0203_4

Langacker, R. W. (1987). *Foundations of cognitive grammar: Volume I: Theoretical prerequisites.* Stanford University Press.

Langacker, R. W. (2008). *Cognitive grammar: A basic introduction*. Oxford University Press.

Leech, G., Rayson, P., & Wilson, A. (2014). *Word frequencies in written and spoken English: Based on the British National Corpus*. Routledge.

Levinson, S. C. (2003). *Space in language and cognition: Explorations in cognitive diversity (Vol. 5)*. Cambridge University Press.

Li, J. (2019). *A Longitudinal study on the use of English spatial verb-preposition constructions by Chinese college students* (Doctoral dissertation, The Information Engineering University of the Strategic Support Force).

Li, Q. (2023). A corpus-based study on the use of high-frequency prepositions between Chinese English learners and native speakers. *Curriculum and Teaching Methodology, 6*(6). https://doi.org/10.23977/curtm.2023.060616

Li, X. (2017). *Spatial conceptual transfer: Evidence from Chinese learners' acquisition of English adverbials and prepositions* (Doctoral dissertation, Northeast Normal University).

Lindstromberg, S. (2010). *English prepositions explained* (2nd ed.). John Benjamins Publishing Company.

Liu, X., & Chen, Y. (2021). A study of bidirectional conceptual transfer in motion events of Chinese EFL learners. *Foreign Language Teaching and Research, 53*(3), 387-399. https://doi.org/10.19923/j.cnki.fltr.2021.03.006

Ma, S. (2007). Acquisition of English spatial prepositions by Chinese students. *Modern Foreign Languages, 30(2),* 173–183.

Murphy, G. (2002). *The big book of concepts*. MIT Press.

Odlin, T. (2005). Crosslinguistic influence and conceptual transfer: What are the concepts? *Annual review of applied linguistics*, *25*, 3-25. https://doi.org/10.1017/S0267190505000012

Park, H. I., Jarvis, S., & Kim, J. E. (2022). Exploring motion event construal: How much attention do speakers of different languages and cultures pay to context? Lingua, 265, 103164. https://doi.org/10.1016/j.lingua.2021.103164

Pavlenko, A. (1998). SLA and acculturation: Conceptual transfer in L2 learners' narratives. Paper presented at the annual meeting of the American Associa*tion for Applied Linguistics (AAAL)*, Seattle, WA, United States.

Pavlenko, A. (2009). *The bilingual mental lexicon: Interdisciplinary approaches*. Multilingual Matters.

Qi, H. (1998). *Research on spatial issues in modern Chinese.* Xuelin Press.

Qiu, C., & Wen, Q. (2020). New pathways in conceptual transfer research: Cognitive contrastive analysis. *Foreign Language Teaching and Research, 52*(2), 225-236. https://doi.org/10.19923/j.cnki.fltr.2020.02.006

Quirk, R., Greenbaum, S., Leech, G., & Svartvik, J. (1985). *A comprehensive grammar of the English language.* Longman.

Rosch, E. (1973). On the internal structure of perceptual and semantic categories. In T. E. Moore (Ed.), *Cognitive development and the acquisition of language* (pp. 111–144). Academic Press.

Rosch, E. (1978). Principles of categorization. In E. Rosch & B. B. Lloyd (Eds.), *Cognition and categorization* (pp. 27-48). Erlbaum.

Rosch, E., & Mervis, C. B. (1975). Family resemblances: Studies in the internal structure of categories. *Cognitive Psychology*, *7*(4), 573-605. https://doi.org/10.1016/0010-0285(75)90024-9

Shin, N., & Lease, S. (2025). Conceptual transfer: The impact of addressee location on Spanish-English bilinguals' nominal demonstratives. *Acta Linguistica Academica, 72*(3), 356–385. https://doi.org/10.1556/2062.2024.00878

Taferner, R. H., & Yamada, J. (2020). Complications in the L2 acquisition of the simple spatial prepositions in and on: Crosslinguistic differences in image schema and family resemblance. *Journal of Second Language Studies*, 3(1). https://doi.org/10.1075/jsls.18015.taf

Talmy, L. (1978). Figure and ground in complex sentences. In J. H. Greenberg (Ed.), *Universals of human language: Vol. 4. Syntax*. Stanford University Press.

Talmy, L. (2000). *Toward a cognitive semantics: Concept structuring systems*. MIT Press.

Tyler, A., & Evans, V. (2003). *The semantics of English prepositions: Spatial scenes, embodied meaning, and cognition*. Cambridge University Press.

Ungerer, F., & Schmid, H. J. (2013). *An introduction to cognitive linguistics.* Routledge.

Wu, H., & Wei, X. (2007). A cognitive semantic analysis of spatial expressions in English and Chinese. *Journal of PLA University of Foreign Languages*, *3*, 1–5.

Xu, Q. (2015). *The influence of prototypicality and interlingual similarity on Chinese learners' use of the English spatial preposition in* (Doctoral dissertation, Shandong University).

Zhang, H., & Liu, Y. (2013). The learning of English prepositions and conceptual transfer: A case study of common preposition collocations and semantic associations. *Foreign Language Teaching and Research*, *45*(4), 568–580.

Zhang, S., & Luo, S. (2017). A study on conceptual transfer in the use of prepositions in English writing by Chinese secondary school students. *Crossroads: A Journal of English Studies, 17*, 45–58. https://doi.org/10.15290/cr.2017.17.2.04

Zhou, W. (2011). *A study on the acquisition of prepositions in modern Chinese.* World Publishing Corporation.

Zhu, L. L. (2023). *A study on conceptual transfer in the acquisition of body-related expressions by advanced Chinese English learners* (Doctoral dissertation, Beijing Foreign Studies University).