A Cognitive Linguistic Approach to Teaching English Prepositions

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Abstract

English prepositions take only a small proportion of the language but play a substantial role. Although prepositions are of course also frequently used in English textbooks for secondary school, students fail to incidentally acquire them and often show low achievements in using prepositions correctly. The strategy commonly employed by language instructors is teaching the multiple senses of prepositions by rote which fails to help the students to draw links between the different meanings in usage. New findings in Cognitive Linguistics (CL) suggest a different approach to teaching prepositions and thus might have a strong impact on the methodologies of foreign language teaching and learning on the aspects of meaningful learning. Based on the *Theory of Domains* (Langacker, 1987), the notions of image schemas (Johnson, 1987) as well as the *Conceptual Metaphor Theory* (Lakoff & Johnson, 1980), the present study developed a CL-inspired approach to teaching prepositions, which was compared to the traditional teaching method by an empirical study conducted in a German school setting. Referring to the participants from the higher track and the medium track, who are at different proficiency levels, the results indicate that the CL-inspired teaching approach improved students' performance significantly more than the traditional approach in all the cases for the higher track and in some cases for the medium track. Thus, these findings open up a new perspective of the CL-inspired meaningful learning approach on language teaching. In addition, the CL-inspired approach demonstrates the unification of the integrated model of text and picture comprehension (the ITPC model) in integrating the new knowledge with related prior knowledge in the cognitive structure. According to the learning procedure of the ITPC model, the image schema as visual image is first perceived through the sensory register, then is processed in the working memory by conceptual metaphor, and finally it is integrated with cognitive schemata in the long term memory. Moreover, deep-seated factors, such as

transfer of mother tongue, the difficulty of teaching materials, and the influence of prior knowledge, have strong effects on the acquisition of English prepositions.

1 Introduction

Prepositions play a very important role in language. Although there is only a small number of English prepositions, they play a substantial role in language and thus appear frequently: in English, one in every eight to ten words is a preposition (cf. Svartvik, 1988; Leech et al., 2001). English may therefore be considered to be a language of prepositions. Furthermore, English prepositions are characterized by polysemy: one preposition can be used (in different contexts) to express two or more different meanings. Take *in* for example, according to Oxford Advanced Learner's Dictionary (OALD) (Hornby & Wehmeier, 2005) and British National Corpus (BNC, 2011), *in* means "within the shape of something" and *sit in an armchair* (BNC, AC5 2362) as adverbial of space expresses spatial relation. The preposition *in* also means "during a period of time" (OALD, 2005) and *in early 1991* (BNC, A03 406) as adverbial of time expresses temporal relation. Moreover, *in* used to "show a state" (OALD, 2005) and *in need* (BNC, A5Y 1120) as adverbial of state expresses abstract relation. "The problem of translation of prepositions is twofold" (Li et al., 2005, p. 412): in different language, the translation of prepositional phrases does not essentially match in meanings and "even for a single meaning, different prepositions are possible". For example, *in the street* and *on the street* are sometimes interchangeable but they have distinct meanings. A street is "a public road in a city or town that has houses and buildings on one side or both sides" (OALD, 2005), so it can be conceptualized as a container as in English, and *On Wednesday I met Mrs Matthews in the street and she asked if I'd taken the cat to the vet and I admitted that I hadn' t* (BNC, A5K 238) is used to express somebody"[somebody] at a point within an area or a space" (OALD, 2005). In American English, our houses are "on" a street, people drive "on" a street and live "on" a street, etc. Because a street also focuses on the road, "without a home; outside, not in a house or other building" (OALD, 2005), it results in a

surface conceptualization. English prepositions are also characterized by multi-function. Most central uses of English preposition characteristically express spatial or temporal relations (e.g. *in*, *under*, *toward*, *before*), and it can also "serve to mark various syntactic functions and semantic roles" (e.g. *of*, *for*) (Huddleston & Pullum, 2002, p. 603). The expressions of spatial relations, such as *in the car* (BNC, AOF 1311), *under the table* (BNC, AB5 987), are very common in our daily life. Similar to the spatial relations, the temporal expressions, such as *in early 1991* (BNC, A03 406), *before 11 pm* (BNC, CK5 199) and the like, are widely used. Of course, a lot of prepositional phrases playing the syntactic and semantic role, e.g. *the outcomes of education* (BNC, AM7 144), *run for a bus* (BNC, A6E 888), cannot be avoided. For students, these characteristics make prepositions a highly difficult item in the target language. Although English prepositions are very high in frequency in every day conversations and therefore also display frequently in English language textbooks, students show rather low learning achievements. Theses natures of English prepositions result in the fact that students are not able to draw links between the different meanings of the occurrences and thus fail to acquire the multiple meanings incidentally. So far, the strategy commonly employed by teachers is teaching the multiple senses of prepositions by rote.

By contrast, meaningful learning as one specific application of cognitive constructivist learning theory points out that meaning is "created through some form of representational equivalence between language (symbols) and mental context" (Cooper, 2009). Mastering such representational equivalence, meanings can be understood and therefore, the language can be acquired. In addition, the ITPC model illustrated thoroughly how meaningful learning processes information through every step at the cognitive procedure. New CL findings systematizing and linking the multiple senses of prepositions provide a fruitful basis for

explaining preposition usage, especially preposition as polysemy, and thus may have an impact on the methodologies of foreign language teaching and learning.

As such, the dissertation is subdivided into six chapters. With each successive chapter, the focus will increasingly sharpen on the main hypothesis that CL-inspired meaningful learning and teaching methods explicitly teaching English prepositions would assist the students to gain better achievements and more improvements.

After this first chapter introduction, chapter two describes the objectives of the present study that are teaching the English prepositions: *in*, *on* and *at*. A subsequent step critically looks at the different strands of preposition teaching approaches based on rote and meaningful learning within the ITPC model, and how CL contributions illustrate the multiple senses of prepositions made within the last three decades. As “prepositions are largely to be learned narrow context by narrow context, often phrase by phrase” (Ming, 2011, p. 1), there is some unavoidable rote learning to be done (Lindstromberg, 1996). Opposed to rote learning, meaningful learning is to incorporate new material into one’s cognitive structures which links new knowledge to previous knowledge (Ausubel, 2000). And the ITPC model illustrates the mechanism of applying meaningful learning from a cognitive point of view. Considering new CL findings, they make the integration between new knowledge and cognitive structures possible. Three important theories are taken into account: Langacker’s *Theory of Domains* (Langacker, 1987) which structures English preposition usage, and also the notions of image schemas (Johnson, 1987) which consist the content of metaphorical mappings and provide the objective foundation, and the insights of Lakoff and Johnson’s *Conceptual Metaphor Theory* (1980) which providex important insights into “the structure, function and processing” of English prepositions. Thus, these “relevant aspects to consider for the language classroom applications” are used to design the present study (Juchem-Grundmann, 2009, p. 3). The last section of this chapter systematically summarizes the

existing material and possible contributions to set up a didactic framework for the CL-inspired approach which is for further didactic implications in teaching the English prepositions *in*, *on* and *at* in the present study and beyond other prepositions for the language classroom applications.

As a result of the preceding didactic and theoretical linguistic exploration, chapter three firstly identifies the central issues to be addressed and formulates four main hypotheses based on three major research questions. In the second section of this part, a pilot study as difficult test is conducted to investigate the difficulty of each item for the further empirical test as well as to have an preliminary view on students' achievements. After the statistic analysis, the test material for the main study is set up. The successive section introduces the main empirical studies exploring the learning of the English prepositions *in*, *on* and *at* by German students from different types of secondary schools. The study is meant to test the conceptual framework presented in the previous part.

Chapter four describes the analysis of the empirical data sets. Reasons for the chosen statistical computation procedures are given and the results of the achievements and improvements taken up in the empirical study are presented. Thus, part three and four provide the basis for chapter five that discusses the actual empirical results in the context of the set research questions. Hence, chapter three, four and five form the empirical part of the dissertation.

Finally, the last chapter again deals with specific implications for teaching. On the basis of the didactic, the theoretical linguistic and the empirical findings earlier statements about and claims for the language classroom are revisited and refined, and finally an agenda for further empirical investigations is sketched out.

2 Theoretical Background

2.1 Research Objectives

The present study is concerned with a CL-inspired meaningful approach to teaching English prepositions to German students from different kinds of secondary school. Specifically, it aims to find out how the underlying CL-inspired meaningful approach can influence the learning of the English prepositions *in*, *on* and *at*. The results of the study will enrich our understanding of interlanguage reconceptualization and the mechanism of learning by a CL-inspired approach.

The present study focuses on the prepositions: *in*, *on*, and *at* which are very close in meaning, frequently used in the spatial as well as in other senses, and are equated with a multitude of contextual translations in school textbooks to cater for rote learning (cf. Celce-Murcia & Larson-Freeman, 1990). On the one hand, these three prepositions (*in*, *on*, *at*) provide the similar concepts which can be generalized as indicating "within a certain space" (OALD, 2005). That is, their basic sense indicates location in space. Thus, to make a choice for an accurate prepositions to express a specific spatial location, may become a big challenge to students. For example, *at the back*, *on the back* or *in the back*, are all the possible expressions. On the other hand, these prepositions have their own unique meanings that eighteen different usages of *in*, eighteen of *on* and fifteen of *at* were illustrated in the Oxford advanced learner's dictionary. When English prepositions are involved in teaching practice, the vast majority of English teachers often plunge into the situation: to teach them by rote or to neglect them (cf. Yang, 2008). Without understanding the intrinsic senses of *in*, *on* and *at*, undoubtedly both English teachers and learners may find that prepositions are difficult to learn. However, meaningful learning as well as new findings in the CL-field may enhance our understanding of prepositions and provide a way for effective teaching. In an attempt to offer

a more structured and explanatory approach to language, the present study first compares rote learning with meaningful learning and then illustrates the multiple senses of English preposition by the CL-inspired approach.

2.2 Research Strands in Teaching: Rote Learning vs. Meaningful Learning

Generally speaking, theories about human learning can be grouped into four broad perspectives (cf. Cooper, 2009): behavioristic perspectives which focus on observable behavior, cognitive perspectives, which regard learning as purely a mental or neurological process, humanistic perspectives, which focus on emotions and affect in learning, and social perspectives, which consider humans to learn best in group activities. Focusing on the cognitive perspectives, there are three branches of educational theory including gestalt learning theory, information processing and computer models, and constructivism. The present study has great interest in constructivism as it is based on progressive education teachings and concerns the reality and meanings in which the learner possesses and uses a variety of cognitive processes during the learning process (cf. Currie, 2008). The common thread of constructive learning theory is that “learning is an active process” and “consists of constructing conceptual relationships and meaning from information and experiences already in the learner’s repertoire” (cf. Cooper, 2009). Regarding the acquisition of English prepositions, the subsumption theory, suggested by Ausubel (2000), which is to “incorporate new material into one’s cognitive structures” as an important application of constructivism (cf. Cooper, 2009), is taken into account. According to Asubel (2000), learning can be either rote learning or meaningful learning. Both learning methods may help students to learn, however, the functions and effectiveness differ from rote learning to meaningful learning.

Rote learning, as defined by Ausubel (1968, p. 108), is simple memorization: the process of acquiring “discrete and relatively isolated entities” that can be related “to cognitive

structure only in an arbitrary and verbatim fashion". During the learning process, the learners make no endeavour to "integrate new knowledge with relevant prior knowledge held in cognitive structure" (Novak & Cañas, 2009) and therefore fail to build a cognitive structure. Cognitive structures are the basic mental processes people use to make sense of information and they play the important role in comparative thinking, in symbolic representation and in logical reasoning (cf. Garner, n. d.). Generally, the memorization technique of rote learning is based on repetition, rather than involves the mental storage of items being associated with existing cognitive structure. Concerning English prepositions, teachers sometimes give the answer "that's the way it is" and that certain prepositions have to be "simply learned by heart". Teaching by rote may have an effect in some ways and Cho (2010, p. 267-269) proves evidence for the fact that students improved a little bit in the post-test on learning the functional uses of prepositions ("encoded [in Japanese] by a postposition only") by a traditional approach which is to "explain the meaning and usage of each example sentence compared with the dictionary definition". However, in her study, students taught by this traditional approach did not improve in achievements on the items referring to the topological uses ("encoded in Japanese by a topological nominal plus postposition"). That is, rote learning still lacks comprehensive analysis of the different senses of prepositions and causes unstable improvements. Without understanding the distinction between different prepositions as well as between different meanings of the same preposition, students have to repeat the correct sentence over and over again. In short, during rote learning, the learners acquire knowledge by simple memorization and make no effort to integrate new knowledge with relevant prior knowledge held in cognitive structures (cf. Ausubel, 1963, 1968, 2000). Not only does this procedure make learners loose their interest, but also they only learn fixed and relatively isolated structures rather than flexible items within an associated cognitive structure (Ausubel, 1968).

Meaningful learning, on the other hand is, “created through some form of representational equivalence between language (symbols) and mental context” (cf. Cooper, 2009). During meaningful learning, learners should “seek way to connect or integrate new concepts or ideas with related ideas in the cognitive structure” which requires them to add new knowledge to cognitive structure as well as refine the existing ideas (Novak & Cañas, 2009). In other words, meaningful learning is the way of knowledge acquisition applying the “prior knowledge to new situations by construction of mental model” (Mayer & Moreno, 2003, p. 43). The procedure of meaningful learning in general includes selecting the information, organizing the information, activating related prior knowledge and constructing coherence formation by integration of information from different sources (see Figure 1, cf. Schnotz, 2005). This procedure reflects the characteristics of constructivist thinking and “enables learners to present their thinking in concrete ways and to visualize and test the consequences of their reasoning” (Jonassen & Land, 2000, p. 15). To illustrate the process of meaningful learning, the ITPC model could give a full view in “building coherent knowledge structures from the available external verbal and pictorial information and from their prior knowledge” (Schnotz, 2005, p. 233).

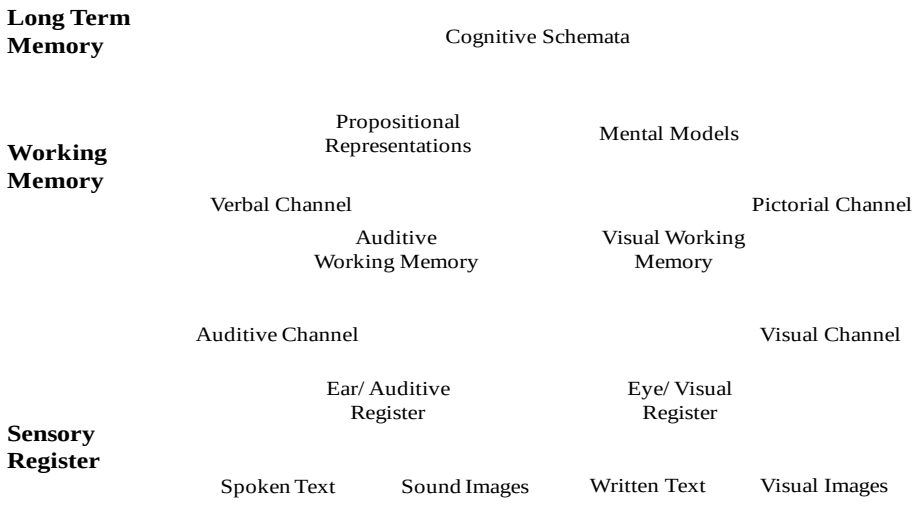


Figure 1. The integrated model of text and picture comprehension (ITPC, Schnotz, 2005)

The ITPC model describes the cognitive processes in mental model construction, such as a limited capacity of the working memory and separate channels to process and store information. In the ITPC model, auditory and visual information is first perceived through separate sensory registers. A sensory register includes auditive register (merged by auditory-verbal channel) and visual register (merged by visual-pictorial channel). Both verbal information and pictorial information are not necessarily associated with the auditory modality and with the visual modality. Then, information is processed in the working memory to form prepositional representations and mental models. At last, information is integrated in the working memory with cognitive schemata which are retrieved from long term memory. Thus, knowledge acquisition results from this meaningful learning procedure of the new knowledge connecting with prior knowledge in cognitive structures.

In order to explore specific teaching approaches serving meaningful learning and making contributions to every procedure within the ITPC model, the present study concerns the findings in the field of CL. CL-inspired teaching materials are based on cognitivist and constructivist insights with the aim of exploring how learners processing and using information during the cognitive procedure. In addition, the CL-inspired teaching approaches as one application of meaningful learning would integrate the new concepts with related ideas in the cognitive structure and would have a great impact on the methodologies of Foreign Language Teaching (FLT) and learning.

CL "investigate[s] the relationship between human language, the mind and socio-physical experience" (Evans et al., 2007, p. 2) and the application of theoretical insights of the CL framework is described by the term Applied Cognitive Linguistics. In order to facilitate the understanding of several grammatical and lexical phenomena, these approaches attempt to improve FLT by providing good explanations (cf. Robinson & Ellis, 2008) by connecting the new knowledge to relevant prior knowledge held in cognitive structures. The teaching of

grammar has always been an important concern and there are several methods and approaches which have been proposed in the teaching of grammar specifically and in the teaching of English as a foreign and second language generally (cf. Cho, 2010; Ma, 2005). Even if several CL-inspired methods have already been developed, their application in classroom situations is still rare and is still at its beginnings (cf. Juchem-Grundmann, 2009).

With the insights of constructive meaningful learning from the background of the CL-inspired teaching methodology, the present study attempts to find new pathways into teaching English prepositions and the following theoretical insights are considered to be helpful: the theoretical insight of Langacker's *Theory of Domains* (Langacker, 1987), the notions of image schemas (Johnson, 1987) as well as insights of Lakoff and Johnson's *Conceptual Metaphor Theory* (1980).

2.3 Cognitive Linguistic Framework

In 1987, Lakoff published his book *Women, Fire and Dangerous Things*, in which he contended that "we structure our knowledge about the world in terms of idealized cognitive models or ICMs" (Velasco, 2001, p. 47). An ICM is a "relatively stable mental representation" (Evans, 2007, p.104) and can be defined as "an organized cognitive structure which serves to represent reality from a certain perspective" (Velaso, 2001, p. 47). Lakoff (1987) further distinguished four types of structuring principle for this kind of construct: propositional, image-schematic, metaphoric and metonymic. In particular, Johnson (1987) pointed out that image schema and metaphorical structure are important and essential to structure human thinking, produce new association, and form new experience.

Cognitive linguists hold that meanings essentially involve an "imaginative" projection by using mechanisms of schematization, categorization, metaphor and metonymy (Lakoff, 1987). In the interaction between human beings and their environment, human experience is imposed on a structure in terms of natural dimensions of the kind. The recurrent experience

leads to the formation of categories, which are experiential gestalts with those natural dimensions. Such gestalts define coherence in human experience. There are two ways for people to understand this experience. The first way is that people understand one thing directly when they see it. These kinds of things are "structured coherently in terms of gestalts that have emerged directly from interaction with and in the environment" (Johnson, 1980. p. 230). By this understanding, the prepositions extend the spatial senses. The second way of understanding (mainly referring to imagination, reason and so on) is required, when perceiving one kind of thing in terms of another kind is involved. According to the target prepositions (*in*, *on* and *at*), their basic senses indicated location in space, the spatial usages of prepositions can be experienced directly, for instance, *in the car* (cf. BNC, A0F 1311), *on the table* (cf. BNC, A73 1000) and *at the door* (cf. BNC, A0D 2658). By the first way to understand this experience, the spatial usages can be acquired straightforward. However, the abstract usages of prepositions are hard to be experienced directly, such as *in love*, *on holiday*, and *at risk*. Thus, the second metaphorical way comes into being. By using "a gestalt from one domain of experience to structure experience in another domain" (Lakoff, 1987, p. 97), lots of abstract concepts are conceptualized on the basis of spatial concepts, that is by metaphor. Thus, prepositions are able to extend the spatial senses to their abstract senses by metaphorical mappings.

This section aims to present the above-described theories and how they structure the logical prepositional meanings of *in*, *on* and *at*. For the purpose of structuring the logical prepositional meanings of these three prepositions, insights of the *Theory of Domains* will be firstly applied to the semantic field of prepositions. First, this theory is based on cognitive principles about the structure of a person's mental lexicon. Secondly, this theory provides the foundation of making choices between the two ways for people to understand different experience. Thirdly, related to meaningful learning, this theory may facilitate the

classification of prior knowledge and new knowledge in order to acquire English prepositions. Therefore, it can provide readily comprehensible explanations. Next in order, as cognitive linguists hold the points that language reflects conceptual structure and embodied experience (cf. Zhao, 2000), Lakoff and Johnson (1980) in their work on metaphor and image schema supported the thesis of embodied cognition in detail. Thus, to illustrate the multiple senses of prepositions from embodied experience to conceptual structure, the concepts of image schema and metaphor will be discussed. These three concepts that are domain, image schema and metaphor, differ from each other but are also inseparable in constructing the multiple senses of English prepositions. Finally, regarding the prepositions *in*, *on* and *at*, the mechanism of cross-domain mappings will be presented in detail.

2.3.1 Domains: the foundation of illustrating prepositional senses

2.3.1.1 The definition of the concept *domain*

The first serious discussions and analyses of domain in the cognitive field emerged during the 1980s. Langacker (1987) developed the *Theory of Domains* and he assumed that domains are mental knowledge structures, which have preconditions for the understanding of lexical concepts (cf. Evans & Green, 2007).

First, a domain is regarded as a cognitive domain. Langacker described that domains are necessarily cognitive and conceptual entities: “mental experiences, representational spaces, concepts, or conceptual complexes” (Langacker, 1987, p. 147). Mental experience is composed of “all processes that take place within the mind of a sentient being” (Moehlig-Falke, 2012, p. 53). Representational spaces are presupposed by the conceived spatial relationships and conversely create the potential for such relationships (Langacker, 1987). One concept (or conceptual complex) is typical to “serving as [a] domain for the characterization of another” (Langacker, 1987, p. 148). Langacker (1987) presents the term of

basic domain and abstract domain, which explain the first property of cognitive domain: "whether a domain can be reduced to more fundamental conceptual structures" (Langacker, 1987, p. 147). "[T]he lowest level in hierarchies of conceptual complexity" is occupied by the basic domains which "cannot be fully reduced to another" and are "not all unrelated" (Langacker, 1987, p. 148). A basic domain "derives directly from human embodied experience" (Evans, 2007, p. 10), referring to "both sensory experience and subjective experience" (Evans, 2007, p.10), such as SPACE, TIME and COLOUR (Evans, 2007, p. 11). In contrast to a basic domain, there is an abstract domain which is "any concept or conceptual complex that functions as a domain for the definition of a higher-order concept", such as "MARRIAGE, LOVE or MEDIEVAL MUSICOLOGY" (Evans, 2007, p. 1). The second property of cognitive domain pertains to dimensionality. The term of dimension can describe "ordering and distance…in a coherent, systematic way for certain concepts in a domain" (Langacker, 1987, p. 150). For example, TIME and TEMPERATURE as basic domains are described as a one-dimensional term whereas SPACE is described as two- or three-dimensional terms (cf. Langacker, 1987). The third property of cognitive domain is "a distinction between locational and configurational domain" (Langacker, 1987, p. 147). That is, a domain is "either locational or configurational" (Langacker, 1987, p.152). For instance, temperature sensation is supported by a location whereas spatial domain is defined by a configuration (Langacker, 1987). "The distinction between locational and configurational domains is elusive" (Langacker, 1987, p. 153), which depends on "whether or not its dimensions are intrinsically calibrated in some way" (Langacher, 1987, p. 153) and in the case of coordinating with the necessary extensionality of different dimensions in the field, "locational domains [can] become configurational domains" (Langacher, 1987, p. 154). For example, "color is a locational domain… in the sense of… a single color" (Langacher, 1987,

p. 154). When it is coordinated "color space with the two dimensions of this field" (Langacher, 1987, p. 154), color becomes a configurational domain.

Here, the concept of *domain*, as a cognitive domain, is similar to the term *frame* which is pointed out by Fillmore (1982). Both terms assume that linguistic meaning is encyclopedic in nature and that lexical concepts are only meaningful because of a person's structured background knowledge (cf. Langacker, 1987; Evans & Green, 2007). According to Langacker, the term *domain* refers to the knowledge structure that is a presupposition for a person's understanding of lexical concepts (cf. Evans & Green, 2007). That is, meaning is equated with conceptualization. In this way, a cognitive domain, as a conceptual entity, is an aggregation within which the meanings of different concept may share the similar characters. Moreover, "semantic structures are characterized relative to cognitive domains" (Langacker, 1986, p. 1).

However, according to Fillmore, the term *frame* refers to the knowledge structure which "is represented at the conceptual level and held in long-term memory and which relates elements and entities associated with a particular culturally embedded scene, situation or event from human experience" (Evans, 2007, p. 85). Thus, a cognitive domain is a conceptual entity, providing the structured background knowledge to understand lexical concepts.

In principle, "a [cognitive] domain constitutes a coherent knowledge structure possessing… any level of complexity or organization" (Evans, 2007, p. 61) and "provides a particular kind of coherent knowledge representation against which other conceptual units such as a concept are characterized" (Evans, 2007, p.61). Therefore, different kinds of conceptual units within the same domain have the same stable knowledge context (Evans, 2007). Take the term of *hot* and *cold* for example, they can only by completely understood within the concept of TEMPERATURE (Evans, 2007). Moreover, a cognitive domain can be any sort of conceptualization which constitutes a concept, a semantic frame or some other

representational space or conceptual complex, and in turn, one concept can relate to more than one domain (cf. Langacker, 1987). For instance, *hot* can also be used to express taste, stature and atmosphere which cannot be fully characterized regarding to the domain of TEMPERATURE. In other words, depending on the basic domain, concepts can form more abstract knowledge context in different domains.

In order to understand how concepts and domains are interrelated, Langacker (1986) assumed that lexicon and grammar form a continuum of symbolic elements which "provide the structure and symbolization of conceptual content" (cf. Clausner & Croft, 1999, p. 5). Different theoreticians use different terms to elucidate the same constructs. According to Lakoff (1987), "a concept is a mental unit and a domain is the background knowledge of representing concepts" (Clausner & Croft, 1999, p. 3) in idealised cognitive model. Metaphor, metonymy and image schema transformation play the role of construal which is "the process by which a person's experience in the word is conceived in a variety of ways" (Clausner & Croft, 1999, p. 3). However, Langacker (1987) uses profile and base to construct the relationship between concept and domain in the cognitive semantics. The base is understood as the presupposed background knowledge, while the profile represents the concept that is evoked and expressed by language. Here, as the variation, the term of profile is equal to concept and the term of base is equal to domain (Clausner & Croft, 1999). The base of a predication is simply its domain and its profile is a substructure elevated to a special level of prominence within the base (Langacker, 1986). Focal adjustment, construal and conceptualization are used to illustrate the relationship between profile and base.

Secondly, a domain is also a conceptual entity employed in *Conceptual Metaphor Theory* as a conceptual domain or experiential domain.

In *Conceptual Metaphor Theory* (Lakoff & Johnson, 1980), domains "are relatively complex knowledge structures which relate to coherent aspects of experience" (Evans, 2007,

p. 61) and they "relate approaches to conceptual projection such as approaches to conceptual metonymy and primary metaphor theory" (Evans, 2007, p. 61). They are the basis of metaphorical mappings. In *Conceptual Metaphor Theory*, there are two major roles of the conceptual domains: source domain (the more general and more concrete domain, usually the physical domain) is the domain which "provides structure by virtue of metaphor" and target domain (normally the more abstract domain) is the domain "being structured by virtue of metaphor" (cf. Evans, 2007, p. 201-202). "[By] cross-domain mappings projecting structure from the source domain onto the target domain… a conventional link [thus is established] at the conceptual level" (Evans, 2007, p. 202). In other words, conceptual structure is organized by cross-domain mappings or correspondences from one conceptual domain onto corresponding representations in another conceptual domain (cf. Evans, 2007). Mappings of this kind serve to structure one conceptual domain, the target domain, in terms of another domain, the source domain. Take the metaphor LOVE IS A JOURNEY for instance. Examples such as: "*This relationship is going nowhere, Our relationship is stuck in the mud*" provide the evidence for cross-domain metaphor mappings (Evans, 2007, p. 202). Here, JOURNEY is the source domain and LOVE is the target domain. The source domain shares the same background knowledge with the target domain and further "highlights certain aspects of the target domain" (Evans, 2007, p. 99). Thus, "when a target domain is structured in terms of a particular source domain" (Evans, 2007, p. 99), other aspects of the target domain are simultaneously hided (Evans, 2007). Due to "a conventional association between the two domains facilitated by long-term cross-domain mappings projecting structure from the source domain onto the target domain", the concepts in the target domain can be understood (Evans, 2007, p. 53).

In short, in order to construct the meaning of concepts, the metaphorical mappings should project from the source domain onto the target domain. A metaphor in CL is the way

of a cross-domain mapping in the conceptual system (Lakoff, 1993). As Lakoff (1993) stated, "metaphorical mappings preserve the cognitive topology (that is, the image-schema structure) of the source domain, in a way consistent with the inherent structure of the target domain" (Lakoff, 1993, p. 215). That is, the basis for metaphorical mappings is based on correspondences in our experience (Lakoff, 1993), or in fact, the similarities between the source domain and the target domain (Lakoff, 1993).

2.3.1.2 Domains for English prepositions

Concerning the English prepositions, Dirven (1993) characterized the spatial conceptualizations of twelve prepositions and established radial meaning networks of meaning from physical space into mental space, that is, from spatial source domains via the domain of time (also possible target domain) to the more abstract target domain. Structuring the meaning of English prepositions, the present study inclines to agree the classification of Radden and Dirven (2007), who further classified prepositional meanings into three domains: spatial, temporal and abstract domain.

As cognitive domains, these three domains constitute the coherent knowledge structure of English prepositions with inherent connection. The cognitive domain of the preposition indicated that all the prepositions in this domain should follow the same stable knowledge context. Although prepositions may be defined differently by different schools, prepositions have the same stable knowledge context within each school. For instance, to most philologists, prepositions belong to the functional words, marking syntactic functions and semantic roles (cf. Hu, 1999; Huddleston & Pullum, 2002), e.g. *the outcomes of education* (BNC, AM7 144) only structure the belonging function rather than provide certain contents; to many structuralists, prepositions are arbitrary signs (Saussure, 2001) which are defined as the relation between two entities (Quirk et al., 1979); to functionalists, prepositions are

regarded as minor verbs which function either as “minor predicators” or as “minor processes” (cf. Halliday, 2000, p. 212-213); and to generativists, prepositions are case-markers which are the heads of prepositional phrases (cf. Chomsky, 2002; Haegeman & Guéron, 1999).

As a conceptual domain, according to the same target preposition, it is “hard to see some boundaries as domain boundaries in any other sense than as a post-hoc classification” (Engberg-Pedersen, 1995, p. 115), because in terms of metaphorical mapping, certain lexemes and function words are used to denote spatial relations, temporal relations as well as abstract relations. Therefore, each preposition may relate to more than one domain. For example, the concepts of *in* may relate to the spatial domain *in the car* (BNC, A0F 1311) as well as to the temporal domain *in 1988* (BNC, A66 1492). However, in order to provide the basis for metaphorical mappings, the distinction between the source domain and the target domain is taken into account and what is directly grounded in embodied experience is regarded as the general standard to define the source domain and the target domain. In 1987, Langacker stated that temporal expressions are metaphorically derived from spatial terms by metaphor.

Nevertheless, as both “time and space are primitive dimensions of cognitive representation” (Langacker, 1987, p. 148), the seemingly result could be that “time is in some sense more cognitively fundamental than space”. A large and growing body of literature has been investigated by Lakoff (1993, p. 218) who supported the claim of a metaphorical mapping from space to time by means of non-linguistic, biological evidence, due to the fact that in our visual systems, “we have detectors for motion and detectors for objects/ locations” but do not “have detectors for time”. In addition, the importance of space is greatly reflected in language that seeks to explore “the fundamental, spatial basis of conceptualization in and through language” (Levinson, 2003, p. xi). In English, spatial relations are mainly expressed by prepositions (cf. Talmy, 1983). The primary senses of prepositions are their spatial senses

and based on the investigation of Cuyckens et al. (2007) the spatial meaning is the most frequently used. Therefore, the spatial sense of prepositions serves as the central prepositional meaning. Accordingly, the spatial domain is the source domain of English prepositions and the temporal domain, illustrating the concept of time, is equal to the target domain. Obviously, the abstract domain, which is not directly grounded in embodied experience, is also defined as the target domain in the present study.

There is ample evidence that languages tend to use the same expressions for spatial, temporal and abstract relations and that there are systematic relations between the use of the expressions for primarily spatial notions, for primarily temporal notions and for primarily abstract notions. As the prepositions (*in*, *on*, *at*) to be learnt in the present study, the examples of *in*, *on* and *at* (the examples are from The British National Corpus) across the three domains are presented in the following Table 1.

Table 1

The English prepositions in, on and at across the three domains

	Spatial domain	**Temporal domain**	**Abstract domain**
in	*in the car* (A0F 1311)	*in 1988* (A66 1492)	*in love* (ADR 1015)
on	*on the road* (A6J 56)	*on Thursday* (AJV 428)	*24 hour on call* (A00 150)
at	*at the door* (A0D 2658)	*at 10.30 p.m.* (KIB 1007)	*at war* (A7C 1322)

Concerning the spatial usages of the target prepositions *in*, *on* and *at* in the spatial domain, human beings need to have certain knowledge about the structure of space. For instance, people should know how objects relate to each other in space: that an object can be enclosed by another, which generally is encoded by the preposition *in*, that an object can be located on the surface of another, which is expressed by the preposition *on*, and that an object can be located at a specific point in space, which is described by preposition *at*. Only with

such background knowledge is it possible to understand the concepts of the prepositions in the target domain.

Therefore, the theoretical underpinnings of the theory of domains can be applied to the semantic field of prepositions by firstly treated as a cognitive domain providing coherent knowledge structure and secondly treated as a conceptual domain supporting mapping from the source domain to target domains.

2.3.2 Image Schema: the concrete structure to extend to abstract prepositional senses

As one among the major foundational pillars of cognitive linguistics and semantics, the theory of image schemas has come to be highly influential in neighbouring areas of study such as developmental and cognitive psychology. The notion of an image schema is closely associated with the development of the embodied cognition thesis, proposed by early researchers in cognitive semantics, notably Lakoff and Johnson. Image schema, which is an important part of thinking structure and is also one of the cognitive models, is useful in explaining the relationships between bodily experience and thought as well as in explaining how concepts are structured in the mind. Thus, it can be regarded as "a subtype of domain" (Clausner &Croft, 1993, p. 4), the subtype of a cognitive domain. Differing from some domains which might be nonimagistic, e.g. *philosophy* and *love*, image schema is always imagistic and schematic (Clausner &Croft, 1993).

2.3.2.1 What is an image schema?

Johnson (1987) firstly proposed that embodied experience gives rise to image schemas within the conceptual system. An image schema is a "recurring dynamic pattern of our perceptual interactions and motor programs that gives coherence and structure to our experience" (Johnson, 1987, p. xiv). Here, *experience* is to be understood in a very rich,

broad sense. Image schemas are not specific images, but generalized schemas which "derive from embodied experience" (Evans, 2007, p.106). In other words, an image schema is a "relatively abstract conceptual representation that arises directly from our everyday interaction with and observation of the world around us [and it] derive[s] from sensory and perceptual experience" (Evans, 2007, p. 106), which is so-called embodied experience. Embodied experience entails that "our construal of reality is mediated in large measure by the nature of our bodies" (Evans, 2007, p. 67). Image schemas not only structure our bodily experience (Talmy, 1977, 1983), but also our non-bodily experience via metaphor (Lakoff, 1987; Johnson, 1987). Due to our direct physical experience, particularly to "our bodily movements through space, our manipulation of objects, and our perceptual interactions" (Johnson, 1987, p. 29), an image schema is on the one hand not abstract because it's embodied (cf. Clausner & Croft, 1999). That means, as we interact with and move around in the world, "our construal of reality is mediated in large measure by the nature of our bodies" (Evans, 2007, p. 67). For instance, objects fall to the ground without support in nature which is resulted from the gravity. Cognitive semanticists argue that given such human vertical axis, we have to "look in one direction (downwards) for fallen objects and in another (upwards) for rising objects" (Evans, 2007, p. 106). Thus, our vertical axis interacting with gravity is meaningful for us. In this way, we interact with our environment. And this aspect of our experience gives rise to the UP-DOWN schema (Johnson, 1987). Accordingly, "image schemas are functions of our bodies and of our interaction in the world" (Evans, 2007, p.106). Moreover, image schemas are not claimed to be innate knowledge structures. They "arise in conjunction with our physical and psychological development during early childhood via a process termed perceptual meaning analysis" (Evans, 2007, p. 106). According to Mandler (2004, 2005), the perceptual meaning analysis is the mechanism whereby perceptual stimuli are re-described from perceptual arrays into rudimentary representations which support more

complex concepts. And it represents the means whereby in early infancy children develop the fundamental plank of the conceptual system known as the image schema. On the other hand, however, an image schema is "abstract" in another sense of schematic (Clausner & Croft, 1999, p.14). Through highly generalization and abstraction as well as due to its flexibility, an image schema can denote not only the concepts of motion and spatial relations (cf. Talmy, 1983), but can also express the phenomenological contours of everyday experience (cf. Johnson, 1987).

Affected by psychological research, cognitive linguistics establishes its own concept of image schema, which differs from other disciplines and had different emphasis with the linguist's and philosopher's different sources of inspiration and foci of interest (Hampe, 2005).The term *image* in *image schema* is restricted to visual perception in everyday language. Because a picture is worth a thousand words (Paivio, 1986), an image can tell us more information in an abstract way. This term is "equivalent to the use of this term in psychology…[and a]nother term for this type of experience is sensory experience" (Evans, 2007, p. 106). *Image*, including its "imagistic" experience, "relates to and derives from our experience of the external world" (Evans, 2007, p. 106) and it has a broader application in psychology and in cognitive linguistics, where it encompasses all types of sensory-perceptual experience (cf. Evans & Green, 2007) that include, but are not restricted to, the visual system.

The term *schema* in *image schema* is also very important. Early developments of the idea in psychology emerged with the gestalt psychologists and the term *schema* was introduced by Piaget in 1926, who pointed out a schema describes an organized pattern of thought or behavior. It was later expanded into schema theory by educational psychologist R. C. Anderson (1977). *Schema* is regarded as a mental network of related concepts that influences understanding of new information, by preconceiving ideas, representing some aspect of the world or organizing and perceiving new information. Since then, different terms

in linguistic have been used to describe schema, such as *frame*, *scene*, and *script*. A *schema* influences attention and the absorption of new knowledge: people are more likely to notice things that fit into their schemas and re-interprete contradictions to the schemas as exceptions or distorting them to fit. From another perspective, *image schema* in cognitive linguistics, *schema* means that "image schemas are not rich or detailed concepts, but rather are abstract concepts consisting of patterns emerging from repeated instances of embodied experience" (Evans, 2007, p. 107). Therefore, "image schemas provide the basis for more richly detailed lexical concepts" (Evans, 2007, p. 107). For instance, the image schema of CONTAINMENT "consists of the structural elements interior, boundary and exterior, [which] are the minimum requirements for a CONTAINER" (Evans, 2007, p. 107). Regarding the examples in Johnson's book (1987) which described the start of an ordinary day, there were obvious containers like bathroom cabinets and toothpaste tubes as well as less obvious "containers" like bed-covers, clothing and rooms. To express the meanings above, the lexical concepts are all related to the CONTAINMENT image schema. The CONTAIMENT image schema generally associated with the prepositions "*full*, *empty*, *in*, *out*, etc." (Evans, 2007, p.107).

Although different scholars proposed their own list of detailed image schemas, they would all agree that "the *term image schema* primarily emphasizes the bodily, sensory-motor nature of various structures of our conceptualization and reasoning" (Hampe, 2005, p.18). As "recurring patterns of our sensory-motor experience by means of which we can make sense of that experience and reason about it, [image schemas] can be recruited to structure [concrete and] abstract concepts and to carry out inferences about abstract domains of thought" (Hampe, 2005, p.18-19). Different image schemas have some common distinctive features to be identified. The first feature of image schemas can be concluded as highly schematic gestalts which can be expressed using schematic sketches (cf. Li, 2003). These schematic sketches normally illustrated by simple lines and circles, providing more concrete information (Li,

2007; Kong, 2010). They can be used to understand the key structure of all the corresponding image schemas and help a lot in memorizing different expressions related to the image schema (Li, 2003). Secondly, image schemas are experiential or embodied preconception structures (Kong, 2010). They are directly meaningful and operate beneath the level of our conscious awareness. The structures are grounded in numerous different embodied human recurrent bodily movements through space, perceptual interactions, and ways of manipulating objects. Thirdly, image schemas can express both dynamic and static concepts (Cienki, 1997). Nearly all image schemas have the two features, because most of them express both a state of one subject and one process of changing or moving. For instance, Krzesowski (1993) used a "plus-minus parameter" to illustrate this generality of image schemas. The last feature of image schema is that as gestalts, image schemas are both internally structured, i.e., made up of very few related parts, and highly flexible. For example, the general image schema of *on* (see Figure 6) is made up of one horizontal line and a round on it. It can describe the situation like *on the table* (BNC, AOL 492). To illustrate on the wall (BNC, A15 1272), this image schema can be transformed into a rotated schema with one perpendicular line and a round on the right or left side.

2.3.2.2 Properties of image schemas

Image schemas are not specific images but are "abstract" in another sense of that word: they are schematic (Clausner & Croft, 1999). They represent schematic patterns "arising from imagistic domains" (Lakoff, 1987, p. 453) that "recur in a variety of embodied domains and structure our bodily experience" (Johnson, 1987, p. 29). Image schemas are also not specific to a particular sensory modality (cf. Lakoff, 1987; Johnson, 1987). Image schemas structure our bodily experience (Talmy, 1972, 1977, 1983) as well as our non-bodily experience via metaphor (cf. Lakoff, 1987; Johnson, 1987).

Lakoff (1987) deemed that image schemas provide particularly important evidence for the claim that abstract mappings are a matter of two things: abstract mappings based on bodily experience and metaphorical projections from concrete domains to abstract domains. "The image schema is a schematic representation emerging from embodied experience, which generalizes over what is common to objects [which] have physical attributes" (Evans, 2007, p.107). The image schema can also be considered as a physical object and "is based on our everyday interaction with concrete objects like desks, chairs, tables, cars and so on" (Evans, 2007, p.107). When the recurrent patterns of sensory information have been extracted and stored as an image schema, sensory experience gives rise to a conceptual representation. In other words, image schemas are concepts, but of a special kind: they are the foundations of the conceptual system, because they are schematic emerged in the human mind; and they are particularly schematic precisely because they relate to sensory-perceptual experience. Moreover, the importance of image schemas is that they are held to provide the concrete basis for these metaphoric mappings. In their work on metaphor, Lakoff and Johnson (2003) claimed that image schemas provide the basis for abstract thought by virtue of serving as the source domain. This image schema can be "mapped onto" an abstract entity via metaphorical mappings. In other words, the image schema, as the content of metaphorical mappings in the source domain, can be projected onto the target domain. For instant, "*inflation,* which lacks physical properties", can be understood by metaphoric mapping "as an abstract entity in terms of a physical object", such as the following: "*Inflation is giving the government a headache; Inflation makes me sick*" (Evans, 2007, p. 108).

2.3.2.3 Categorization of image schemas

Due to the different understanding of image schema, different scholars have given different list of image schemas. A partial list of those image schemas which have been identified so far is given in Table 2 (cf. Hampe, 2005; Li, 2008, p. 192; Evans, 2007, p. 108).

Table 2

A listing of image schemas

Group	**Image schema**	**Resource**	**Main type**	**Subclass**
SPACE	UP-DOWN	Lakoff, 1987, p. 267	II	B
	FRONT-BACK	Lakoff, 1987, p. 267	II	B
	LEFT-RIGHT	Clausner and Croft, 1999, p. 15	III	B
	NEAR-FAR	Johnson, 1987, p. 126	II	A
	CENTRE-PERIPHERY	Lakoff, 1987, p. 267; Johnson, 1987, p. 126	I	A
	CONTACT	Lakoff, 1987, p. 267	II	A
	STRAIGHT	Cienki, 1998, p. 107-149	II	B
	VERTICALITY	Evans, 2007, p. 108	I	A
	PATH	Johnson, 1987, p. 126	I	A
CONTAINMENT	CONTAINER	Johnson, 1987, p. 126	I	A
	IN-OUT	Johnson, 1987, p. 126	I	A
	SURFACE	Johnson, 1987, p. 126	II	A
	FULL-EMPTY	Johnson, 1987, p. 126	II	A
	CONTENT	Johnson, 1987, p. 126	I	A
LOCOMOTION	MOMENTUM	Mandler, 1992, p. 593-596	III	A

	SOURCE-PATH-GOAL	Johnson, 1987, p. 126	I	A
BALANCE	AXIS BALANCE	Johnson, 1987, p. 126	I	A
	TWIN-PAN BALANCE	Johnson, 1987, p. 126	I	A
	POINT BALANCE	Johnson, 1987, p. 126	I	A
	EQUILIBRIUM	Johnson, 1987, p. 126	I	A
FORCE	COMPULSION	Lakoff, 1987, p. 267; Johnson, 1987, p. 126	I	B
	BLOCKAGE	Lakoff, 1987, p. 267; Johnson, 1987, p. 126	I	B
	COUNTERFORCE	Lakoff, 1987, p. 267	I	B
	DIVERSION	Lakoff, 1987, p. 267	I	B
	REMOVAL OF RESTRAINT	Lakoff, 1987, p. 267	I	B
	ENABLEMENT	Lakoff, 1987, p. 267	I	B
	ATTRACTION	Lakoff, 1987, p. 267	I	B
	RESISTANCE	Lakoff, 1987, p. 267	I	B
UNITY/ ITERATION, MULTIPLICITY	PART-WHOLE	Johnson, 1987, p. 126	I	A
	LINK (AGE)	Johnson, 1987, p. 126	I	A
	MERGING	Johnson, 1987, p. 126	II	A
	COLLECTION	Johnson, 1987, p. 126	II	A
	SPLITTING	Johnson, 1987, p. 126	II	A
	ITERATION	Johnson, 1987, p. 126	II	A
	MASS-COUNT	Johnson, 1987, p. 126	II	A

IDENTITY	MATCHING	Johnson, 1987, p. 126	II	A
	SUPERIMPOSITION	Johnson, 1987, p. 126	II	A
EXISTENCE	CYCLE	Johnson, 1987, p. 126	II	A
	OBJECT	Johnson, 1987, p. 126	II	A
	PROCESS	Johnson, 1987, p. 126	II	A
	REMOVAL	Evans, 2007, p. 108	I	A
	BOUNDED SPACE	Evans, 2007, p. 108	I	A

The image schemas listed in main type I appear in both Johnson's and Lakoff's classification and constitute the core of the standard inventory (Johnson, 1987, p. 126; Lakoff, 1987, p. 267; Lakoff & Turner, 1989, p. 97-98; Cienki, 1997, p. 3-12; Clausner & Croft, 1999, p. 15). The more diverse items in II-A occur only in Johnson's list, and the orientation schemas in II-B only occur in Lakoff's discussion (Hampe, 2005, p. 2). The image schema list has never constituted a closed set, and by far not all of the numerous subsequent additions were as closely related to its original spirit, as the few additional examples given in main type III.

Moreover, Lakoff and Johnson's original representations of the term specifically emphasized the bodily experience:

> "Image schemas are relatively simple structures that constantly recur in our everyday bodily experience: CONTAINERS, PATHS, LINKS, FORCES, BALANCE, and in various orientations and relations: UP-DOWN, FRONT-BACK, PART-WHOLE, CENTER-PERIPHERY, etc." (Lakoff, 1987, p. 267).

Some of the schemas proposed by Johnson, illustrating this clear link with physical experience, are: PART-WHOLE, CENTER-PERIPHERY, LINK, CONTACT, ADJACENCY, SUPPORT, BALANCE, and CONTAINER (Johnson, 1987, p. 126).

Although researchers (cf. Pauwels & Simon-Vandenbergen, 1993; Cienki, 1997; Peña, 1999, 2000) have pointed out that image schema can be characterized in different theoretical ways, in the present study focusing on the English prepositions *in*, *on* and *at*, image schemas of them as CONTAINMENT for *in*, CONTACT for *on*, and ADJACENCY for *at* are considered. The reasons for choosing these image schemas for the present empirical study as well as how to illustrate their image schema and the usages of them are discussed in the following section.

2.3.2.4 How to illustrate concepts by image schemas?

It is through image schemas that concepts of many relations between entities can be represented. The way to illustrate concepts by image schemas started from Talmy's discussion of figure and ground in the early twentieth century and it can "give the characterization in the area of semantics" (Talmy, 1978, p. 630). The figure object is "a moving or conceptually movable point whose path or site is conceived as variable and the particular value of which is the salient issue" (Talmy, 1983, p. 232). The ground object is a reference-point, "having a stationary setting within a reference frame, with respect to which the figure's site, path, or orientation" is characterized (Talmy, 1983, p. 232). In English, spatial layouts are usually represented with the help of prepositions (cf. Landau & Jackendoff, 1993; Zlatev, 1997; Ming, 2005). In other words, "preposition[s] describe the location of the target in relation with both relata" (Baltaretu et al., 2013). A spatial expression usually takes the form of N_1+P+N_2. The first noun (N_1) represents the entity to be located which is the Figure, the second noun (N_2) identifies the location, moving path or orientation which is the ground, and the preposition denotes the relationship between the two entities. However, in some special cases, the N_2 could be unspecified. For instance, in the sentence *The plane flew over* (Ungerer & Schmid, 2001), N_1 refers to *the plane*, the preposition refers to *over*, and N_2 is unspecified, which could refer to house, river and the like. As a specific application derived

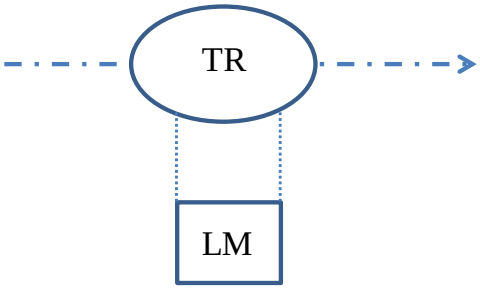
from the psychological terms figure and ground (cf. Talmy, 2007; Ungerer & Schmid, 2006), image schemas expressed by the trajector and the landmark can also illustrate the concepts. The present study inclines to use the trajector-landmark pattern to express image schema and further to illustrate concepts. Because “meaning is thought to be conceptually structured” (Evans & Green, 2007, p. 162), the perception of the world may vary from person to person, which is “determined by cognitive constructions and conceptual processes” (Tyler & Evans, 2003, p. 18-19). Thus, the scope of predication, which is divided into the profile and the base (Evans, 2007), may be perceived differently.

According to Langacker (1987), an image schema is composed of a trajector, a landmark and a path which denotes the asymmetry relationship between the trajectory and the landmark. The trajector (the TR) is the main body in the asymmetric relations and its spatial direction is undecided. It has a special status (as a most prominent focal) and is characterized as the “figure within a relational profile [which] determines the scope of the scene or sets the stage of the scene by introducing the hearer-speaker and the object to be located and the coordinate system” (Thiering, 2011, p. 247). The landmark (the LM) is “the secondary participant in a profiled relationship” (Evans, 2007, p. 119), acting as a frame of reference and providing less salient element for the moving direction of the TR. The distance that the TR covers is called path. There are many different aspects of the LM-TR relationship. The aspects that may be relevant are the shape, size, and the dimensionality of the LM and the TR; the presence and the absence of contact between the TR and the LM; the distance between the TR and the LM; the orientation (e.g. superior/inferior, inclusion-exclusion) of the TR with respect to the LM, and so on (Taylor, 1989).

An image schema can present both a static and a dynamic relationships. If the relationship is static, the path equals zero and the image schema denotes the place of the TR. Alternatively, if the relationship is dynamic, the relationship may be one of a goal (the end-

point of the TR's movement is highlighted), source (or orientation, the starting-point of the TR's movement is highlighted), or path (a consequence of an end point or goal being related to a starting point or locational source).

For instance, the image schema in Figure 2 represents the dynamic relationship between the plane and the house in the sentence *The plane flew over the house* (Lakoff, 1987, p. 419). The sphere denoting *the plane* is the TR; the rectangle below is the LM denoting *the house*; and the arrow denotes the path that the TR goes along. In order to express the static relationship between the plane and the house in the sentence *The plane is over the house*, the path equals zero and the arrow could be left out. In addition, there are special cases where the LM is unspecified as in the sentence *The plane flew over* (Ungerer & Schmid, 2001). Here, the rectangle below as the LM could be left out.



The plane flew over the house.

Figure 2. The central image schema of *over* (Lakoff, 1987, p. 419)

2.3.2.5 The image schemas of *in*, *on* and *at*

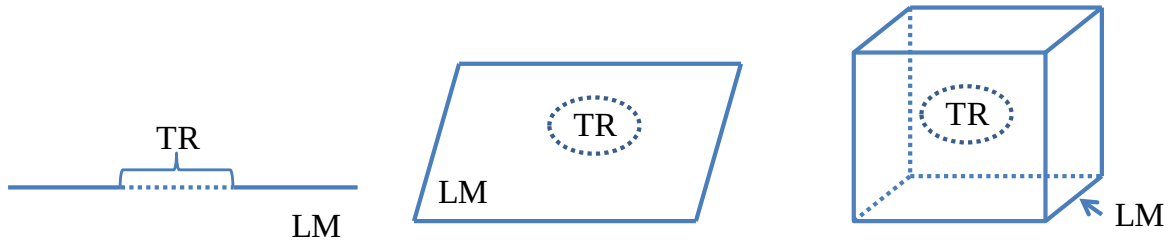
The expressions of the image schemas of *in*, *on* and *at* are illustrated and discussed in the following section with the analysis of the corpus-based examples (BNC, 2011).

The image schema of *in*

The preposition *in* activates an abstract concept that depicts a particular location or a movement of a TR in comparison to a LM in the CONTAINMENT image schema (cf. Dai,

2007). Generally speaking, on the one hand, *in* can firstly indicate the location of interiority. On the other hand, *in* can also reveal a final state of inclusion after a dynamic process.

The basic spatial meaning of *in* is the location of *interiority*, which is defined as inclusion or containment of a located object (the TR) in the reference object (the LM). In principle, this interiority may: (1) be either partial or total; (2) be a specific range across objects of any dimension; (3) be either real or virtual (Frawley, 1992). Herskovits (1986) also defines the ideal meaning of *in*: inclusion of geometric construct in a one-, two-, or three-dimensional geometric construct. Figure 3 illustrates these definitions with the examples.



(a) One-dimensional LM (b) Two-dimensional LM (c) Three-dimensional LM

Figure 3. CONTAINMENT schema for *in* (Herskovits, 1986)

Image schema of *in* in Figure 3 (c) is the most typical one for the preposition *in*. The three dimensional LM is more like a prototypical *container* than that in (a) and (b) because it has a clear interior, and the TR is fully contained. For example, in the sentence *We were in my room* (BNC, AE0 311), *my room* denotes the concept of CONTAINMENT as the LM and *we* can be considered as the TR. In order to present the location of interiority, the preposition *in* is applied here.

Secondly, the preposition *in* is used to express the final static status after an object (the TR) moving towards a destination consisting of an enclosing boundary and an interior (Lindner, 1982). The path stops at the interior of the LM (see Figure 4).

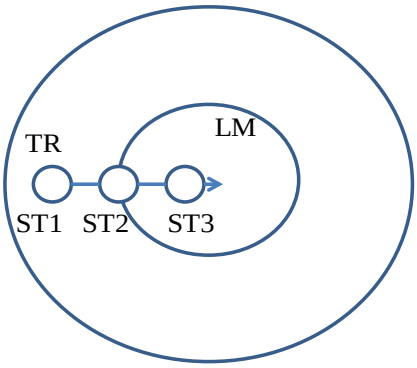


Figure 4. Schematic representation of *in* indicating the final inclusive status of a process (Lindner, 1982)

The whole process involving from exclusion to inclusion shows that after moving from stage 1 (ST1), via stage 2 (ST2) and the TR finally arrives at stage 3 (ST3) within the LM. Although as far as in the verb-particle construction the spatial meaning of *in* is concerned, three decisive stages of a dynamic process from exclusion to inclusion are related and it usually results in the final stage of a dynamic process. In the example of *My first big chance to put money in the bank came in 1986 when Middlesex awarded me a benefit* (BNC, CBG 1151), *money* is considered as the TR and *the bank* is the LM. The process includes ST1 that the TR is in my hand, ST2 that the TR is on the way to the bank and ST3 that the TR is within the bank (the LM). The final outcome of a process experienced by the TR within the LM as the reference point is highlighted.

To sum up, the spatial meanings of *in* can be distinguished into two categories according to the TR-LM relation and all the two kinds of image schemas are related to CONTAINMENT schema that our body experiences are as inclusion. Therefore, the basic spatial meanings of *in* is used and designed as CONTAINMENT schema in the present study.

Throughout the present study, the image schema of *in* is considered as CONTAINMENT with events occurring within this container. To illustrate the CONTAINMENT image schema

of the present study for 7th grade students, the TR is colored purple as the central square and the LM is colored brown (see Figure 5).

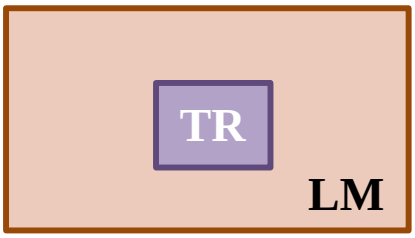


Figure 5. The CONTAINMENT image schema of *in* in the present study

In order to provide visualized and attractive image schema for the design of teaching material, the two-dimensional static image schema is chosen. Herskovits (1986, p. 8) noted that "the preposition *in* falls into primarily static category". The image schema of *in* in the present study can not only be explained as one-, two-, three-dimensional LM as a static relation, but also the final inclusive status of a process can also be regarded as a static scene. Thus, in the present study, the CONTAINMENT image schema of *in* is used to illustrate the concept of *in* and is applied to the examples referring to *in* (see Appendix D: teaching materials for CL-inspired meaningful learning).

The image schema of *on*

The spatial senses of *on* usually indicate a surface with two dimensions (Zhang, 1991) and are generally classified into five image schemas: CONTACT, SUPPORT, PRESSURE, CONSTRAINT and PATH (Ming, 2011).

The most familiar usage of the preposition *on* is that the TR has contact to an LM which plays the role of support as a surface but the TR is not any part of the LM. The CONTACT schema can be transformed into a rotated schema and an attachment schema which may suffer from certain modifications due to the perceptual shifts of perspectives or profile (Ming, 2011). For example, we can use the CONTACT image schema of *on* to describe the spatial situation *on the table* (BNC, AOL 2252). After 90° rotating, we can also use the same image

schema to express *on the wall* (BNC, A74 815). Therefore, a general schema of *on* can be shown in the following way:

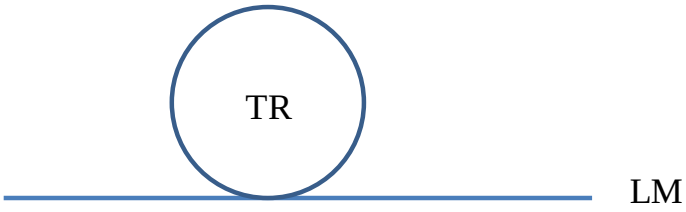


Figure 6. General image schema of *on* (Ming, 2011)

In the case of *on*, the TR and the LM bear a relationship of CONTACT. When we pay attention to the topological relationship between the TR and the LM, this contact is always perceived as in relation to the outside part of the LM and to the resting part of the TR.

Secondly, focusing on the SUPPORT image schema of *on*, there are some overlapping characteristics with other image schemas. The SUPPORT image schema of *on* expresses the functional relationship between the LM and the TR and normally the entity (the TR) is on the upper surface of another (the LM) which shares overlapping spatial meaning with CONTACT and CONTAINMENT image schemas. On the one hand, some examples of the image schema CONTACT can also be described as a support relation. If the TR is in contact with the LM, the LM will offer a background or support the TR. Some examples are put in the group of the CONTACT schema (such as *a large grain ship on the river*, BNC, HRT 2837), because the image schema CONTACT is more salient than that of SUPPORT in these cases. Here, the TR is not only supported by the LM but also the LM provides a surface-like entity adjoining the TR. In the example *a large grain ship on the river*, the *river* is like a line serving as a surface and supports the *large grain ship*. Oppositely, the SUPPORT schema is more obvious in the example of *The house rests on the foundation* (Ming, 2011, p.68). In such cases, the TR is an entity which is subject to the laws of gravity that is, it rests on the surface associated with the LM so that its weight presses upon it. This relationship can also be described as a support

relation. Such relation occurs between the TR and the LM so that the upward facing boundary is associated with the LM or with a horizontal surface of the LM. On the other hand, in some case studies (cf. Yang, 2008) referring to vehicles, the image schema of *on* may also be regarded as CONTAINMENT, e.g. *on the train* (BNC, A3M 148). However, in these cases, the image schema of SUPPORT is more substantial than CONTAINMENT (Ming, 2011). Ming (2011) found that there is the usage of *on* to denote a kind of support from a vehicle, such as a ship, aircraft and train etc., in which the supporting surface in it (the floor or seats) is the more salient aspect of the scene rather than simply a physical container (Herskovits, 1986). Thus, *on* phrases referring to vehicle are concluded as SUPPORT image schema.

Similarly, if one object controls the location of the other by opposing the force of gravity, it can be expressed as a PRESSURE schema which can be considered as complementary to the SUPPORT schema. When one of the participants holds control over the other, the controller will always be the TR of *on*, and the controlee will be the LM (Ferrando, 2001). From the example …*responsible for making the mincer, the weighing machine and the coffee grinder on the table* (Ming, 2011, p. 73), *the coffee grinder* contacts with *the table* and is supported by *the table*. Meanwhile, as the force is mutual, *the coffee grinder* also exerts pressure on *the table*. Hence, a PRESSURE schema is involved in such cases.

If the LM constrains the movement of the TR that can not move freely, the change of perspective results in the CONSTRAINT schema of *on*. Beitel (1997) describes the inference structure of the CONSTRAINT schema as a constrained entity lacking of some essential freedom and if the constrained entity is released, it requires freedom. However, this freedom might be destructive to the agent itself or to the surrounding entities. For example, in the sentence *LEFT The steps in training your dog to walk correctly on the leash are shown here* (BNC, CJE 455), there is a certain contact between *the leash* (the LM) and *the dog* (the TR). But a kind of constraint of the LM (*the leash*) on the TR (*the dog*) is more salient so that the

leash constrains the freedom of the dog to move freely. If *the dog* is released from *the leash*, *the dog* will be free to move (Ming, 2011). In other words, the CONSTRAINT schema is normally static schemas within special time duration and situation.

As Herskovits (1986, p. 8) notes, "prepositions fall into two categories: some are primarily static (e.g., *at*, *in*, *under*); others primarily dynamic (*to*, *from*, *via*)". Focusing on the static prepositions, a corpus-based survey of Yang (2008, BNC from 1980 to 1993) displays that the static usages of *at* are 95.03%, that of *on* are 98.84% and that of *in* are 97.25%. But sometimes static prepositions can be used in dynamic contexts (e.g. *I ran to the bedroom and heaved myself under the bed*. BNC, HA0 1211), and dynamic ones can be used in static contexts (e.g. *It should be alongside the wall, or about one foot away from the wall to allow space for the carer*. BNC, AS0 67). Similarly, the preposition *on* is primarily static, but it can also be used in the dynamic context. And there is a kind of dynamic schema of *on*, which is described here as PATH image schema (see Figure 7). Taking an instance, in the sentence *'Al Capone has got his finger on the trigger at long last.'* (BNC, HWA 2083) the preposition *on* in this situation denotes a kind of dynamic relationship between the TR (finger) and the LM (trigger). In the specific context of the one tightening the attachment, there is a series of movement involved in the process.

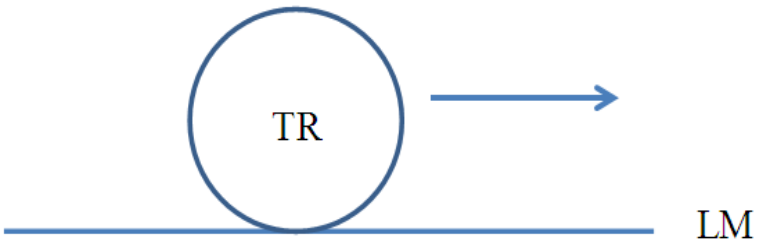


Figure 7. PATH schema for *on* (Ming, 2011)

The specialization of *on* takes place by simple highlighting one of the perceptual aspects. It must be kept in mind that categories for senses are fuzzy, and many examples are of difficult classification. The different image schemas of *on* in fact reflect different aspects of one general schema, while they can be considered as a static schema CONTACT. Moreover, these image schemas themselves are related to each other in systematic ways that reflect speakers' sensory-motor organization. In the present study, the general image schema of *on* as CONTACT in the static process is considered, in order to present a simplified teaching method for English beginners. The design of it is shown below.

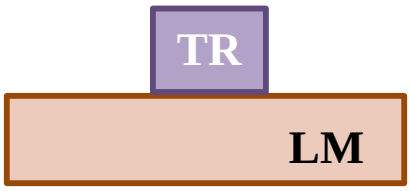


Figure 8. The CONTACT image schema of *on* in the present study

The TR is colored purple as the square on the top and the LM is colored brown under the TR to support it with closed contact (see Figure 8). The detailed examples of *on* which would be explained by this image schema can be found in Appendix D.

The image schema of *at*

In the study of Yang (2008), based on the BNC (from 1980 to 1993), the image schemas of *at* are classified into CONTAINMENT, ADJACENCY, LINEAR-RELATION, DYNAMIC-RELATION.

The image schema of *at* as a CONTAINMENT differs from that of *in*. In the container-relation of *at* (see Figure 9), "one smaller point is contained by a relatively larger point in our mind" (Yang, 2008, p. 44). Contrary to the image schema of *in* that the TR is enclosed in the LM which is regarded as two- or three-dimensional entities (cf. Zelinsky-Wibbelt, 1993), the

spatial relations of *at* are "regarded merely as a point of orientation in our eyes" (Yang, 2008, p. 44), e.g. the relatively smaller places as home, school and theatres. The example *I contacted ACET who I knew provided practical care at home* (Yang, 2008, p.45) displayed the relations between *ACET* and *home* with the help of *at*, showing all the objects can be regarded as points in our eyes. A special case for this situation could be *He is a famous scientist at home* (Yang, 2008, p. 45). Here, *home* could be more like an abstract concept and in the example above, *at home* can be regarded as a point close to the abstract concept home which show a state relation rather than simple spatial relation. And the non-spatial relation is taken into account by *close to* rather than as *contained in*. In the present study, such kinds of relations are not considered as spatial experience but are seen as abstract concepts which are mapped by image schema via conceptual metaphor. Thus, to structure the image schema of the present study, the CONTAINMENT image schema of *at* is not taken into account.

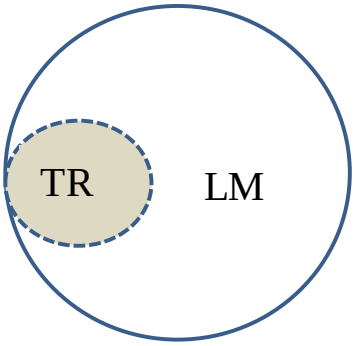


Figure 9. CONTAINMENT schema for *at* (Yang, 2008)

ADJACENCY indicates a neighbourhood relation between objects: one object is next to another, infinitely adjoining but never coming to a convergence. That is to say, some distance has been more or less kept between the two objects without any contact. To illustrate this situation, the image schema of *at* as adjacency is shown in Figure 10 which denotes the adjacent relationship between one point and another. For example, in the sentence *There she*

was at the door (BNC, ATE 1666), *she* is the TR and *the door* is the LM. With the help of *at*, the situation shows that *she* is next to the LM *door* without contacting with the door.

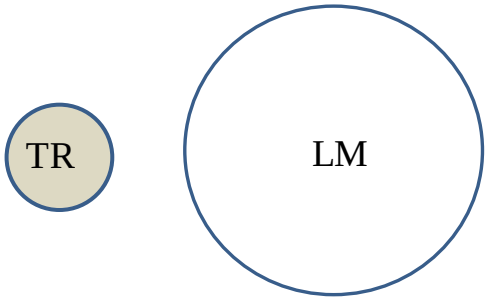


Figure 10. ADJACENCY schema for *at* (Yang, 2008)

LINEAR-RELATION of *at* performs a special kind of image schema reflecting the relation between an object and a line, say, an object as a point (the TR) at the end of the line (the LM). This image schema of *at* indicates a point on a line, whether it is the starting point or the end point (see Figure 11). The sentence *Combine this with a seat at the water's edge and you have a lovely place to sit* (Yang, 2008, p. 48), indicates an ending point on a line or a line as a point (Yang, 2008).

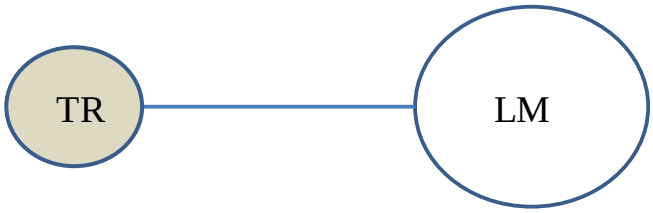


Figure 11. LINEAR-RELATION schema for *at* (Yang, 2008)

However, here, we can also regard the *seat* (the TR) as one point which is close to *the water's edge* (the LM). There is some distance between the two objects and the TR and the LM are without any contact. Thus, in the present study, the LINEAR-RELATION is regarded as a sub-category of the ADJACENCY image schema.

The DYNAMIC-RELATION of *at* indicates that one object is moving from one space to another (Figure 12).

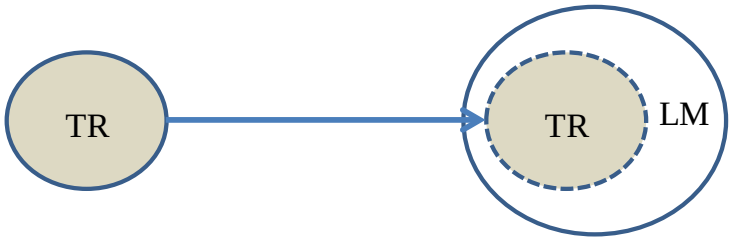


Figure 12. DYNAMIC-RELATION schema for *at* (Yang, 2008)

In Figure 12, the TR moves toward the LM in a dynamic way and eventually puts itself at the place of the LM, and then the process is fulfilled. To take an example, *Hostess should be pleased to see a total stranger arrive at her dinner party* (Yang, 2008, p. 52), *a stranger* sets out from an unknown address (the starting point as a source), but *the dinner party* is his terminal (the ending point as a goal), and this is described by the image schema DYNAMIC-RELATION of *at* emphasizing the dynamic process (the path linking the source and the goal). However, this situation could also be interpreted by ADJACENCY as a static scene of the process that the TR *a stranger* is adjoining to the LM *dinner party*. Thus, the ADJACENCY schema emphasizes the whole picture rather than the detailed stages within the DYNAMIC-RELATION schema.

To sum up, the image schema of *at* is used in the following terms of ADJACENCY that one object infinitely adjoins to another but never coming to a convergence. To structure the image schema of ADJACENCY in the present study (see Figure 13), the image schema from Figure 10 is used for reference.

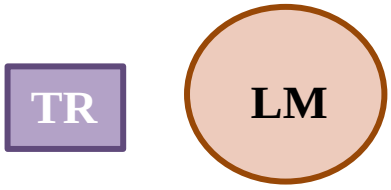


Figure 13. The ADJECENCY image schema of *at* in the present study

The TR is consistently colored purple in a square as a point orientation on the left, the LM is colored brown next to the TR. The detailed examples of *at* which may be explained by this image schema can also be found in Appendix D.

2.3.2.6 Summary

As we mentioned above, the image schema of *in* is used in terms of CONTAINMENT, indicating the interiority (e.g. *We were in my room.* BNC, AE0 311) and the final inclusive status of a process (e.g. *My first big chance to put money in the bank came in 1986 when Middlesex awarded me a benefit.* BNC, CBG 1151). In all these examples, the spatial relationship can be described as the TR is within a container (the LM), such as *room* and *bank* in different examples, leading to use the preposition *in.*

The image schema of *on* is specified as CONTACT, referring to the support, pressure, constraint and path relation. For instance, in the support relation *The house rests on the foundation*(Ming, 2011, p.68), *the foundation* contacts with *the house*. In the pressure relation that *...responsible for making the mincer, the weighing machine and the coffee grinder on the table*(Ming, 2011, p. 73), the *coffee grinder* contacts with the *table*. In the constraint relation, *LEFT The steps in training your dog to walk correctly on the leash are shown here* (BNC, CJE 455), the leashed *dog* has to contact with the *leash*. The same in the path relation, *There aren't many men who would attack a woman on the street* (BNC, CB8 110), *woman* must stand (contact) on *the stree*t and then would be attacked there. To sum up, all the relations

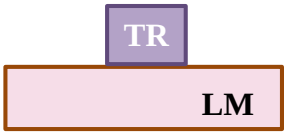
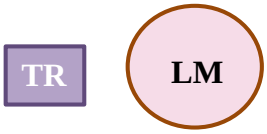
could be concluded as CONTACT relation. Thus, the image schema CONTACT of *on* is the foundation and can be applied to describe the support, pressure, constraint and path relation.

Regarding to the image schema of *at*, even if there are different classifications, the image schema as ADJACENCY for the basic spatial relation is concluded. For the CONTAINMENT relation for *at*, the present study considers it as abstract relation rather than spatial relation. Thus, it is not considered the image schema of *at* as CONAINER in the present design. In the image schema of LINEAR-RELATION as in *Mellowes at one end of the table, Forbes at the other* (Yang, 2008, p. 48), the *Mellowes* can be regarded as one point and *one end of the table* as another point while the *Mellowes* is quite close to the *end of the table,* which shows the ADJACENCY relation. In the image schema of DYNAMIC-RELATION as an example, *In an hour we will be at Aberfeldy, at the Flemyngs' house at Moness, we* are going closer and closer to *Aberfeldy*. Obviously, ADJANCENCY relation could explain this situation in a more general sense.

Based on embodied experience, the image schemas of *in*, *on* and *at* for 7th grade students are structured in a concise way. These considering the image schema of *in* as CONTAINMENT, the image schema of *on* as CONTACT and the image schema of *at* as ADJACENCY are taken into account in the design of the teaching material for the experimental group in the present study.

Table 3

Image schemas of prepositions in, on and at with their application of the present study

in	**on**	**at**
		
e.g. He's driving in the car.	e.g. There is a rabbit sitting on the rock.	e.g. Do you know the man standing at the door?
TR= he LM= car	TR= a rabbit LM= the rock	TR= the man LM= the door

In Table 3, the image schemas used in the following study and related examples are displayed. With this systematic illustration, the concrete structure will be extended to abstract prepositional senses. Afterwards, the methods for meaningful learning as well as teaching materials are discussed.

2.3.3 Metaphor: the mechanism of cross-domain mappings

Research on metaphor has a long and controversial history. In literature, i.e. narrative, poetry drama as well as rhetoric, metaphor is an analogy between two objects or ideas, conveyed by using a word instead of another word. One of the earliest views on metaphor can be dated back to Aristotle. In his definition, metaphor "consists in giving the thing a name that belongs to something else; the transference being either from genus to species, or from species to species; or on grounds of analogy" (cf. Parker, 1987, p. 36). Thus, a metaphor is a figure of speech that describes a subject by asserting that it is, at some point of comparison, the same as another otherwise unrelated object. Traditionally, metaphor is so viewed as a set

of extraordinarily figurative expressions. It's an ornamental device being widely used in literary and rhetoric.

In cognitive linguistics and psycholinguistics, there has been an explosion of research on metaphor and related topics since the 1970s. Many researchers found that metaphor is cognitive in nature. A metaphor is a specific mental mapping that influences how people think, reason, and imagine in everyday life (e.g. Gibbs, 1994; Johnson, 1987, 1993; Lakoff & Johnson, 1980; Lakoff, 1987; Lakoff & Turner, 1989; Sweetser, 1990; Turner, 1991). Metaphor is fundamentally conceptual in nature, not only linguistic, and metaphorical language is a surface manifestation of conceptual metaphor (Lakoff, 1992).

2.3.3.1 Conceptual metaphor

Metaphor is not only treated as an extraordinary or figurative use of language, but is also a figure of thought in nature (Lakoff & Johnson, 1980; Lakoff, 2006). Conceptual metaphor theory emphasizes "the experiential basis of many of the metaphors described" (Evans, 2007, p. 137). The study of Zhao (2000) supports the statement that 70% of our ordinary language is based on conceptual metaphors. Metaphor is pervasive in our daily life, which "[is] grounded in the nature of our everyday interaction" (Evans, 2007, p. 75) "with the socio-physical world of embodied experience" (Evans, 2007, p. 138). Due to the fact that "thought itself is fundamentally metaphorical in nature" (Evans, 2007, p. 35), metaphor is regarded as "a basic and indispensable instrument of though" (Evans, 2007, p.136). The general way of understanding a relatively abstract subject in term of a more concrete subject via metaphor is based on the cross-domain mappings: metaphor can project the structure from the source domain onto the target domain (Evans, 2007).

Metaphor, especially referring to conceptual metaphor here, is "a form of conceptual projection involving mappings or correspondences holding between distinct conceptual

domains" (Evans, 2007, p. 136). *Conceptual Metaphor Theory* was first presented by Lakoff and Johnson in their 1980 volume *Metaphors We Live By*, which "provided much of the early theoretical impetus for the cognitive semantic approach to the relationship between language, mind and embodied experience" (Evans, 2007, p. 34). The basic premise of *Conceptual Metaphor Theory* is that "thought itself is fundamentally metaphorical in nature" (Evans, 2007, p. 34-35). In other words, metaphor is as a common feature of everyday speech. For example, *Their marriage has been a long bumpy road* (Evans, 2007, p. 137). It uses the metaphor, in which love is conceptualized as a journey, and this unified way of conceptualizing love metaphorically is in the linguistic expression of marriage.

2.3.3.2 The nature of metaphor

Our conceptual system is composed of a metaphorical part and a non-metaphorical part (Lakoff & Johnson, 1980). Metaphorical understanding is grounded in non-metaphorical understanding. Abstract concepts generally belong to the metaphorical part whereas in the non-metaphorical part the concepts are normally concrete. In order to understand the abstract concepts in the metaphorical part, a conceptual system contains thousands of conventional metaphorical mappings. Cross-domain mappings "provide one of the key ways in which the conceptual system is organized" (Evans, 2007, p.52). Accordingly, referring to cross-domain mappings based on the *Theory of Domain*, the non-metaphorical aspects can be regarded as referring to the source domain and the metaphorical aspects referring to the target domain. Based on these aspects of two distinct conceptual domains, a set of conventional mappings is used to provide projecting structure from [one conceptual domain,] the source domain, onto the target domain (Evans, 2007, p. 53). An image schemas are consistently regarded as such a structure, providing the concrete basis for metaphoric mappings. That is, as important components of conceptual metaphors, conventional mappings between distinct conceptual

domains “allow inferences which hold in the source to be applied to the target” (cf. Evans, 2007, p. 136). Therefore, according to Lakoff (1992), based on the mechanism of metaphor, abstract concepts can be comprehended and abstract reasoning can be performed. In addition, many ordinary abstract concepts, such as time, state, quantity, change, action, and so forth (Lakoff, 2006), are structured and mentally presented in terms of metaphor. That is, in the conceptual system, the nature of metaphor is that inherently unstructured subject is structured in terms of a more concrete, or at least a more highly structured subject, can be understood by cross-domain mappings.

2.3.3.3 The structure of metaphor

Lakoff (1992) pointed out that metaphors are mappings across conceptual domains. Each mapping is a fixed set of ontological correspondences between entities in a source domain and entities in a target domain. When those fixed correspondences are activated, mappings can map inference patterns from the source domain onto the target domain. Such mappings are asymmetric, partial and unidirectional from source domain to target domain. They are not arbitrary, because they are grounded in our everyday experience and knowledge. According to *Conceptual Metaphor Theory*, we can think and talk about one domain due to cross-domain mappings. This kind of mappings persists “in long-term memory and serve to structure one conceptual domain in terms of another domain” (Evans, 2007, p. 51).

In practice, cross-domain mappings are conceived of a stable relationship holding between sets of concepts belonging to two distinct domains, source domain and target domain (see Figure 14).

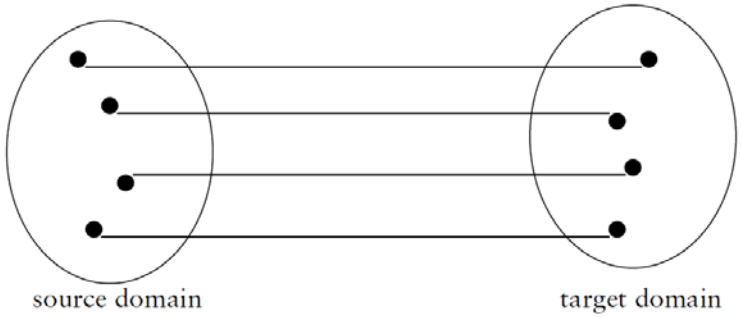


Figure 14. Cross-domain mapping (cf. Evans, 2007, p. 53)

Here, “the small black circles represent concepts and the connecting lines represent cross-domain mappings” (Evans, 2007, p. 53). The mappings from source domain onto target domain are unidirectional. Thus, a conceptual metaphor is set up by “a set of cross-domain mappings holding between two distinct conceptual domains” (Evans, 2007, p. 53).

Due to the fact that “the essence of metaphor is understanding and experiencing one kind of thing in terms of another” (Lakoff & Johnson,1987, p. 5), the samples below illustrate the way of how money can be experienced and understood in terms of liquid and how the related cross-domain mappings are to be characterized.

The conceptual metaphor MONEY IS LIQUID serves to structure the target domain MONEY in terms of the source domain LIQUID which allows us to think and talk about MONEY in terms of LIQUID. The source domain LIQUID shares the same stable relationships with the target domain MONEY. A metaphor of this kind is made up of a number of conventional mappings stored in long-term memory which is set out below in Figure 15 (Rohrer & Vignone, 2012, p. 16-17):

flow	→	cash flow
moves freely	→	money moves freely
cycle of waves	→	financial cycles
frozen liquids don't move	→	frozen assets, credit freeze, frozen markets
liquids evaporate, dry up	→	money supply disappears
liquid solvents can dissolve objects	→	solvency means that if there is enough money to cover the debt, it can make is disappear
water amasses in pools and reservoirs	→	money can amass as pools of funds, capital reserves
concentration- % of solutes in solution	→	concentration % of assets in a portfolio
water is channelled to irrigate farms		money is channelled to investments
heavy solids sink in liquids	→	large debts can cause a business or person to be over their head, underwater, sink or even drown
lighter solids float in liquids	→	if able to pay debt, a business or person can stay afloat

Source domain: LIQUID **Target domain: MONEY**

Figure 15. Cross-domain mappings of MONEY IS LIQUID

The *flow* from the domain of LIQUID is conventionally mapped onto that of *cash flow* in the domain of MONEY, the notion of *moves freely* is mapped onto that of *money moves freely* and so on. Hence, we understand MONEY in terms of LIQUID due to a conventional association between the two domains facilitated by long-term cross-domain mappings projecting structure from the source domain onto the target domain.

2.3.3.4 Structure the abstract senses of prepositions by metaphor

As polysemous forms, English prepositions are simply represented as arbitrary discrete words that happen to share the same phonological form (cf. Tyler & Evans, 2001). Wood (1967, p. vii) stated that "the different meanings of each preposition are unrelated and the various meanings of a preposition are arbitrary". The traditional linguists have great difficulty in explaining the phenomenon of polysemy, especially the relationship between various senses of a word. Generally, they applied the *abstract* view and *synonym* view. However, they fail to explain the semantic extension of prepositions. For example, the two sentences *He is feeling up* and *He is happy* have the same meaning. There is no so-called *abstract* general sense between *up* and *happy* and these two words cannot be called *synonym*. Thus, a new method to explain the polysemy nature of preposition is required.

According to the *polysemy* view, the multiple senses associated with a single word are related to each other (Tyler & Evans, 2003) and the various senses of prepositions are assumed to be systematically related (Tyler & Evans, 2004), because experience "plays a vital role in both the extension of spatial senses and metaphorical senses" (Lakoff, 1987, p. 266).

As mentioned in the concept of a conceptual domain, "one concept can relate to more than one domain" (Langacker, 1987, p. 154) and can be extended from the source domain to the target domain via conceptual metaphors. As a reminder, with regard to English prepositions, the spatial domain is the source domain whereas the target domain includes the temporal domain and the abstract domain. As "spatial metaphors are a kind of image-schematic metaphors of high degree of cognitive indispensability" (Lakoff & Turner, 1989, p. 99-100) which can be mapped onto different target domains, the prepositions extend the spatial senses to temporal and abstract senses by using various metaphorical mappings.

The explanations provided by *Conceptual Metaphor Theory* are suggested to foster the understanding of these prepositional meaning extensions from the cognitive semantic point of view. In order to apply the insights of *Conceptual Metaphor Theory* to the semantic field of prepositions, an easy-to-understand non-metaphorical example is provided first. To explain the metaphorical mappings of the senses of the English prepositions *in*, *on* and *at*, some spatial examples from the BNC are shown in the sentences below.

1 (a) B1H 1705 *In these areas some houses were abandoned and slowly became derelict.* (SPACE)

(b) G17 1556 *The gold on the floor reflected his face, distorting it.* (SPACE)

(c) A7J 1661 *At the door she could not resist a parting shot.* (SPACE)

In these sentences, the literal meaning of these three prepositions normally describes spatial relations. And the stable relationships of the target prepositions are the image schema CONTAINMENT for *in*, the CONTACT for *on* and ADJACENCY for *at*. By cross-domain metaphorical mappings, these prepositions can metaphorically extend their senses to the temporal and the abstract domain. In other words, the image schemas based on the spatial relations in the source domain can be extended to the target domain by metaphorical mappings. Hence, the abstract senses of prepositions can be built up in the temporal and the abstract domain and further be understood with the help of image schemas.

Metaphorical mappings for *in*

Firstly, with metaphorical mappings, the preposition *in* can describe metaphorical enclosures with the image schema CONTAINMENT and transfer this structure from the spatial relations to the temporal and the abstract domain. In sentence 1 (a), preposition *in* provides the CONTAINMENT image schema. Its literal meaning is described by preposition *in* to show the containment with houses (the TR) within these areas (the LM). The TR in this sentence is enclosed by the LM and *in* is used to express such a spatial relation, such as

CONTAINMENT. Sentences 2 (a)-(c) illustrate the usages in the temporal domain whereas sentences 3 (a)-(e) illustrate the usages in the abstract domain. In order to express the abstract senses, the examples shown below can also be interpreted by the image schema CONTAINMENT.

2 (a) CR9 3334 *Most of the costliest disasters in recent years were storms.* (TIME)

(b) A03 406 *In early 1991, AI received a letter directly from the two men*. (TIME)

(c) A05 1210 *In middle age he has experienced a breakdown, an identity crisis*. (TIME)

3 (a) BPC 23 *Include People in picture for added interest.* (ABSTRACT SPACE)

(b) EA4 73 *Greenwich Council is facing legal action for failing to house a young woman who was assessed as in need*. (STATE)

(c) *A0L 3210 I tell myself she's got my number — in more ways than one*. (METHOD)

In the sentences above, the example for the preposition *in* in 2 (a)-(c) literally describe the extension of spatial relations to the temporal domain which is understood by the image schema of CONTAINMENT via metaphor. In 2 (a), the TR *storms* happened within the LM *recent years*. This example indicates the temporal interiority and that the time duration, such as a period of time of a day (in the morning), week, month, season, year and century, is considered as the LM and *in* is used to describe the container relation. The same is in 2 (b) and 2 (c). The concepts, *1991* (a precise year) and *middle age*, are regarded as a container relation which provide the CONTAINMENT schema for temporal interiority.

Sentence 3 (a)-3 (c) are used to explain the extension of CONTAINMENT schema to the abstract domain. The TR *people* are included within the LM *picture*. Expressed by image schema CONTAINMENT, the LM can provide a container to surround the TR. And his spatial interiority relation from the spatial domain is mapped onto the abstract domain with the same interiority relationship. In 3 (b), the TR *a young woman* is covered by the LM *need* that

within the container of need, the TR in 3 (b) may require a house; in 3 (c), within the LM *many ways*, the TR *my number* can be gotten, that is, my *number* is included in *many ways*.

By mapping the inference pattern of CONTAINMENT from the spatial domain, temporal relations within the temporal domain as well as the relations within the abstract domain can be understood. In summary, sentence 1 (a) describes the literal meaning of the preposition *in* in the spatial domain with the TR *some houses* within the LM *these areas* (SPACE). Sentences 2 (a)-(c) and 3 (a)-(c), separately, describe the metaphorical meanings of the preposition *in* being enclosed by a time interiority (TIME) or by an abstract interiority, such as STATE, METHOD and so forth. All these stable relationships from different domains can be associated together by metaphor.

Metaphorical mappings for *on*

Secondly, the preposition *on* can describe metaphorical CONTACT, SURFACE and SUPPORT with the image schema CONTACT that is happened from the spatial domain to the temporal and the abstract domain. Some of the temporal examples are shown in the sentences 4 (a)-(c) and the abstract examples are shown in the sentences 5 (a)-(c).

4 (a) AAW 328 *A short lifter had accounted for Hardie on Saturday.* (TIME)

(b) A0J 655 *Don't forget to use a sunscreen on overcast days*. (TIME)

(c) AD1 787 *She is the sisters' friend and mine, too, she has come to tea on my birthday*. (TIME)

5 (a) G0Y 1759 *John's on call today.* (STATE)

(b) A0F 2088 *An idea suddenly dawned on me*. (ACTION)

(c) a0R 568 *During the next two days I advised on industrial relations problems in catering, computers and property services*. (ASPECT)

In the sentences 4 (a)-(c) and 5 (a)-(c), the literal meaning of the prepositions *on* which normally describes spatial relations are metaphorically extended to describe the temporal and

the abstract relationships. In the example of the preposition *on* in 4 (a), for instance, *A short lifter*, is regarded as a TR which is closely connected to the LM *Saturday*. Via metaphorical mappings, the preposition *on* in this situation can denote the CONTACT relationship between the TR and the LM that the temporal concepts, a special day or a period of a day or holiday and anniversary (cf. Yang, 2008), are like a conveyor belt supporting the TR. *Overcast days* in 4 (b) and *my birthday* in 4 (c) are all related to the concept of days and therefore, the CONTACT schema is used to illustrate these situations with the help of *on*.

Sentence 5 describes the example in the abstract domain. In 5 (a), *John* as the TR is contacted with the LM *call*. *John* and *call* are inseparable, which indicates when someone calls up, John should be there. In 5 (b), the *idea* has close interaction with *me* and I gradually understand the *idea*. Expressed by image schema CONTACT, *idea* here is the TR and *me* is the LM. Similar to 5 (b), in 5 (c), the TR *I* is equal to the TR *me* and the LM *industrial relations problems* is equal to the LM *idea*, which have close contact interaction. Thus, the spatial CONTACT image schema is metaphorically mapped onto this abstract relation to support and contact with the *idea* (the TR).

In short, sentence 1 (b) describes the literal meaning of the preposition *on* with the LM *floor* supporting and contacting with the TR *the gold* (SPACE). Sentences 4 (a)-(c) and 5 (a)-(c), describe the metaphorical meanings of the preposition *on* by mapping the image schema CONTACT from the spatial domain onto the temporal domain by being contacted by a time designation(TIME), especially days, as well as onto the abstract domain by a contact abstract designation, such as STATE, ACTION, ASPECT and so forth.

Metaphorical mappings for *at*

Thirdly, the ADJACENCY image schema can be used in cross-domain metaphorical mappings to express adjacency relationships, which can illustrate temporal and abstract

senses of preposition *at* in the temporal and the abstract domain. Some examples in the temporal domain and in the abstract domain are described below.

6 (a) B2E 123 *At 10 am precisely a bell rang and Miss Maine took me for introductions.* (TIME)

(b) A06 193 *This means that there is usually only one 'show-case' production at the end of the year for agent and production managements to see.* (TIME)

(c) F9A 800 *At the time the first radiocarbon dates were calculated*. (TIME)

7 (a) BNL 1761 *In either case you can easily and very quickly dehydrate and put your life at risk*. (STATE)

(b) ASE 708 *The child continued to gaze at her*. (ACTION)

(c) B34 1466 *I was good at sewing, you see, and a good knitter*. (ASPECT)

(d) CK1 1709 *A man who is so abnormal as to weep at the death of his wife is said to be behaving illogically*. (CAUSE)

In the sentences 6 (a)-(c) and 7 (a)-(d), the literal meaning of the prepositions *at* which normally describe spatial relations are metaphorically extended in the temporal and the abstract domain. Regarding to the temporal relations, the preposition *at* in 6 (a)-(c) describes a temporal adjacency relation based on the metaphorical mappings in the spatial domain. Via metaphorical mappings, the preposition *at* can denote the ADJACENCY relationship between the TR and the LM that the temporal concepts as the LM, such as a special time (at 10 o'clock) or rough time (at lunch time) or holiday and age (cf. Yang, 2008), are considered as a point closer to the TR. Different from *on*, the name of a holiday matched with *at* is always without "day", such as *Christmas* whereas the holiday matched with *on* is always written with "day", such as *birthday*. In 6 (a), the TR *a bell rang* took place at a special time which is described by the LM *10 am*. In this situation, the time is illustrated by the ADJACENCY schema. In 6 (b), the LM *the end of the year* is also a special time adjacent to the TR *one*

'show-case' production, which is described like a point concept in the space and transferred to the temporal domain by metaphor. The same in 6 (c), the LM the time as rough time is closer to the TR *the first radiocarbon dates were calculated* and can be explained by the ADJACENCY schema.

Sentences 7 (a)-7 (e) provide examples of how the ADJACENCY schema applied in the abstract domain.

In 7 (a), the TR is *They had missed his flute* and the LM is *wedding*. In this situation, the LM is rather an abstract space in the abstract domain than a certain place in the special domain. "Spatial relations entail the ties between real entities and objects in sight" whereas "abstract spatial relations are mapped from physical and real spatial locations or the shadows of practical spatial relations", that is, "abstract spatial concepts in mind are perceived in terms of real spatial concepts in sight" (Yang, 2008, p. 54). Back to 7 (a), *at risk* is apprehended in virtue of *at door*, that the TR *dehydrate and put your life* is adjacent to the LM *risk*. In 7 (b), the TR is *the child* and the LM is *her*, and especially, the extension of child's sight would be contact with *her*. Expressed by the image schema ADJACENCY, here, the TR *child gazed* and the LM *her* denotes the adjacency relation that the TR as the terminal point is close to the sight of child. Thus, *at* is used to describe such ADJACENCY schema. In 7 (c), the TR is *I* and the LM is *sewing*. As *sewing* includes many different kinds of skills, such as knitting and tailoring, *I* could only contact with some skills and to the sewing, *I* still close to it and therefore *at* is used. In 7 (d), the TR is *a man weep* and the LM is *the death of his wife*. Here, *at* is used to describe the ADJACENCY schema that *weep at the death of his wife* signifies his weep adjacent relation with the death of his wife.

In short, sentence 1 (c) describes the spatial meaning of the preposition *at* with the TR (*she*) and the LM (*the door*) to describe the spatial adjacency relationship (SPACE). Sentences 6 (a)-(c) and 7 (a)-(d) describe how is the cross-domain metaphorical meanings

extended by this image schema. Regarding to *at*, the ADJACENCY schema can be metaphorically understood the time as a point (TIME) in the temporal domain (such as a special time or rough time or holiday and age) as well as a concept of point in the abstract domain reflected from the value of *at* in space domain, to express STATE, ACTION, ASPECT and the like.

2.4 Summary

Generally speaking, the procedure of learning English prepositions by the CL-inspired meaningful learning approach follows the ITPC model within the steps of: starting with sensory register, processing information in the working memory and connecting new knowledge with prior knowledge in cognitive structures. Firstly, meaningful learning provide more visual images when starts with the sensory register process. Teaching English prepositions needs auditive register which requires spoken text and sound images as well as visual register which requires written text and visual images. Both traditional rote learning approach and the CL-inspired meaningful learning approach may provide spoken text, sound images and written text for the auditive register and the visual register. Referring to the amount of providing visual images, the traditional rote learning approach differs from the CL-inspired meaningful learning approach. The CL-inspired meaningful learning, as a constructive cognitive approach, may formulate more visual images than the traditional rote learning approach, which are illustrated as image schemas. Because image schemas can illustrate embodied preconception structures and concepts by the TR and the LM as mentioned before, the CL-inspired meaningful learning approach may contain more visual images than the traditional rote learning approach, especially referring to abstract concepts. Secondly, meaningful learning is more effective than the rote learning in associating the information getting from working memory with cognitive schemata in long term memory.

The mechanism of the CL-inspired meaningful learning approach is providing a scaffold to associate the mental storage of items with existing cognitive structure (as cognitive schemata in ITPC model) by cross-domain metaphorical mappings. During this procedure, the source domain on the one hand provides the foundation for metaphorical mappings, and on the other hand, the domain as a conceptual domain facilitates the classification of prior knowledge and new knowledge. In order to acquire English prepositions, the prior knowledge may mostly stem from the spatial domain as the source domain. Thirdly, the domains as cognitive domains are regarded as cognitive schemata and constitute the coherent knowledge structure of English preposition in the long term memory.

Moreover, the specific approach for meaningful learning is based on the theoretical work above and the cross-domain mapping model (cf. Evans, 2007, p. 53). Concerning the English prepositions, the framework of the present study is illustrated in Figure 16.

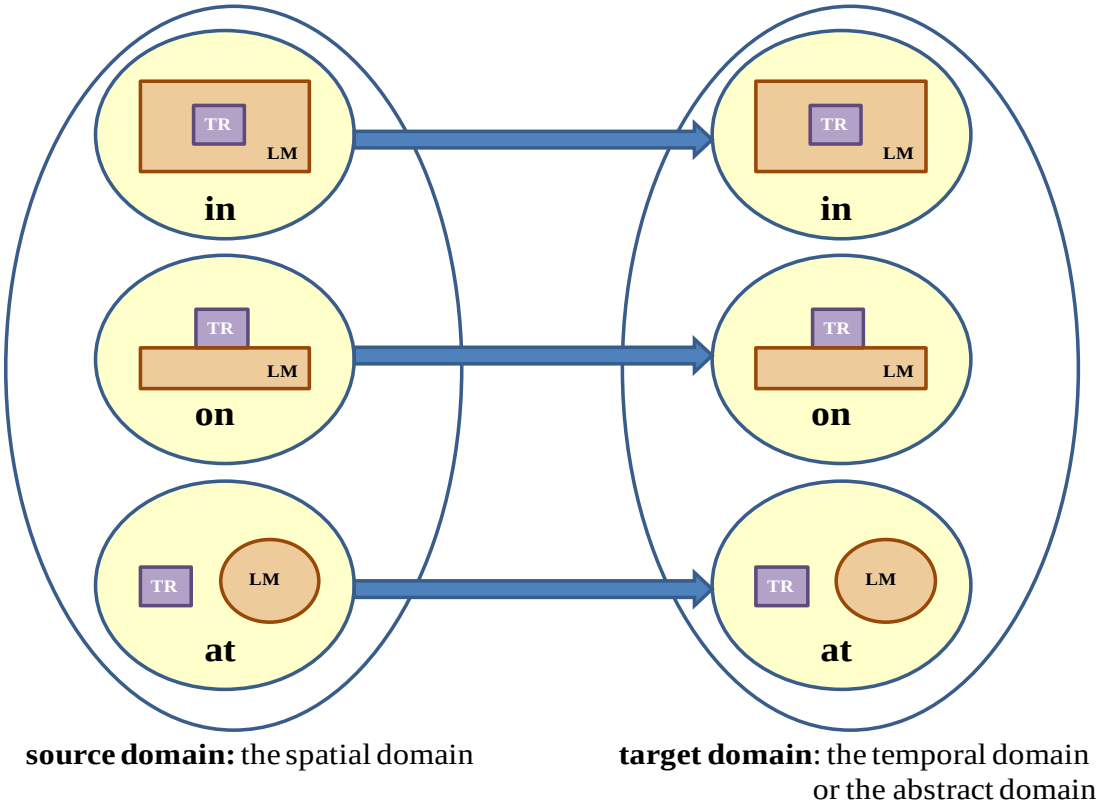


Figure 16. Cross-domain mapping of prepositions *in*, *on* and *at*

The big transparent circles represent the domains. The one on the left is the source domain which is the spatial domain referring to the basic prepositional meaning, and one on the right is target domain that is, to the temporal domain or the abstract domain. Mappings take place from the spatial domain to the temporal domain or from the spatial domain to the abstract domain. In addition, the mappings from the source domain onto the target domain are unidirectional. The small semi-transparent circles represent the cognitive domain of each preposition. In each circle, there is the image schema for the corresponding English preposition. This image schema is mapped from the source domain onto the target domain. The present study uses the most central image schema for *in*, *on* and *at*, that is CONTAINMENT for *in*, CONTACT for *on* and ADJACENCY for *at* to explain the different uses of the prepositions. The connecting lines represent the cross-domain mappings by metaphor.

Therefore, the CL-inspired approach based on the ITPC model can be applied to English prepositions' teaching and learning. An empirical study focusing on this issue will be presented in the following chapters.

3 Design and Methodology of the Empirical Study

Based on the set-up of the previous studies that were discussed in part two, three basic research questions have been formulated that provide the basis for further operationalization. First, focusing on regular English course of teaching English prepositions at secondary school, does the CL-inspired teaching approach differ from the traditional rote approach? Do they have different effects on knowledge acquisition which would be reflected by the achievements and improvements after learning? Second, does the CL-inspired teaching and learning methodology and material exert the same degree of influence on different schooling tracks? Third, are there any deep-seated factors (i.e. mother tongue, the influence of prior knowledge) constraining the learning of English prepositions by rote learning and meaningful learning, how and to what extent do these factors impact the learning process?

This part reports the pilot study as a difficulty test as well as the main study to test how the CL-inspired approach influences the learning of English prepositions (with respect to achievements and improvements): whether this approach has the same effectiveness in teaching English prepositions as the traditional teaching approach, whether this approach exerts the same degree of impact on the learners at different proficiency levels (the students from different type of secondary school), and how the achievements and improvements reflects the deep-seated factors during the whole experiment.

In the run-up to the main study reports here, a pilot study is meant to examine the difficulty of each item for the main study and to have a preliminary view on how German students generally performed applying different prepositions across the three domains. On the one hand, in order to avoid a ceiling effect and a floor effect in the main study, the pilot study seek to set up a test with balanced difficulty of the items focusing on the three prepositions across the three domains. On the other hand, the rationale is that before applying the CL-inspired approach, German students as the most students learning English as a foreign

language in general (cf. Cho, 2010; Ma, 2005; Javis & Odlin, 2000), regarded the preposition learning as one of the hardest problems to tackle and may have problems in understanding and using English prepositions which is really a challenge for them. And the average means of the achievements may reflect this fact.

The main study is set out to examine the four basic research questions from two aspects. First, according to the students at different proficiency levels, whether and to what extent the CL-inspired approach differs from the traditional approach (the similarities and dissimilarities of teaching efficiency between meaningful learning and rote learning), is tested within each type of secondary school and between the two types focusing on the achievements in the post-test and the improvements from the pre-test to the post-test. Secondly, whether there are deep-seated factors constraining the learning of English prepositions by rote learning and meaningful learning is tested within each track and between the two tracks. According to the different proficiency levels, different types of secondary school (grammar school and comprehensive school are considered in the present study) are taken into account.

In Germany, there are three different types of secondary school which are grammar school, comprehensive school and "general school". Firstly, grammar school, the so-called *Gymnasium*, is with a strong emphasis on academic learning. It is a very highly selective school where most of the students are college-bound and stringent grading is traditional. Pupils of average ability find themselves at the bottom of their class and might have done better at another type of school (cf. Tücke, 2005). Secondly, in the German secondary school system, it is the comprehensive school (the so-called *Realschule* and *Realschule Plus*). In comparison with the grammar school, the pupils are given a more vocationally-oriented education. The achievements of the students attending a comprehensive school are outperformed by those attending a "general school" (cf. Ehmke et al., 2004). The "general school", which is the so-called *Hauptschule*, is the third type in Germany secondary school

system, which educates students having learning difficulties or need special attention. After interviewing the school's English teachers, they point out that applying a CL-inspired approach is possible in grammar school and comprehensive school.

3.1 Methodology of the Pilot Study: Test of Item Difficulties

3.1.1 Material

For the difficulty test which was arranged as a pilot study, nine different sets of questions are designed (Booklet I, Booklet II, Booklet III, Booklet IV, Booklet V, Booklet VI, Booklet VII, Booklet VIII, and Booklet IX), which all tested the same prepositions: *in, on* and *at*. Each booklet has two parts and a total of seventeen items. These items refer to the three prepositions (*in, on* and *at*) in the three domains (spatial domain, temporal domain and abstract domain). The items were selected from online dictionaries, such as www.dictionary.cambirdge.org, English textbooks, such as English G 2000, and from the British National Corpus. The selection criterion considers the content of the teaching and testing martial as well as the vocabulary and knowledge structure of students.

Part one has ten items and consists of gap filling that requires the knowledge of different prepositions across each domain. Participants should know the difference between the prepositions. In Booklet I, Booklet II, and Booklet III, the knowledge of these three prepositions is tested within the spatial domain. In Booklet IV, Booklet V and Booklet VI, the knowledge of these three prepositions is tested within the temporal domain. And in Booklet VII, Booklet VIII, and Booklet IX, the knowledge of these three prepositions is tested within the abstract domain. Possible answers to fill the gap are one of the selected prepositions *in, on* or *at* or leaving it blank, that is *no preposition*. In total, there is an equal number of nine items for *in* in the spatial domain, nine items for *in* in the temporal domain and nine items for *in* in the abstract domain. Following the same pattern, the prepositions *on* and *at* are dealt with.

Furthermore, there are also nine items where *no preposition* at all is needed. In total, part one with nine different booklets has ninety items.

Part two consists of seven items where sentences with a proper combination of *in*, *on*, *at* or *no preposition* and phrases to be taken from a given table have to be completed. There are seven phrases in the given table which can be matched with *in*, *on* or *at* and one phrase that does not need a preposition. To complete part two, firstly, phrase displayed in the table should be appropriate to complete the sentence. Secondly, correct preposition should be chosen to make the phrase and sentence semantically and structurally acceptable and meaningful. One exception is that one phrase didn't need any preposition, such as there was no need to using preposition before the phrase *this year*. Again, two items for each preposition focus on the spatial domain (in Booklet I, Booklet II, and Booklet III), two on the temporal domain (in Booklet IV, Booklet V, and Booklet VI) and two on the abstract domain (in Booklet VII, Booklet VIII, and Booklet IX). In total, there is an equal number of six items for *in* in the spatial domain, six items for *in* in the temporal domain and six items for *in* in the abstract domain. Following the same pattern, the prepositions *on* and *at* are dealt with. Furthermore, in each booklet, there is also one item where *no preposition* would be appropriate. In total, in part two with nine booklets there are sixty-three items including twenty-seven items for each preposition and nine items where *no preposition* would be appropriate.

For each correct answer one point could be scored. The total score is 17 points with 10 points in part one and 7 points in part two of every booklet. In total, the nine booklets thus have 153 items and offer 90 points in part one and 63 points in part two.

3.1.2 Participants

Data collection took place at a medium-sized grammar school with students from Grade 5 to Grade 12 and a medium-sized comprehensive school with students from Grade 5 to Grade 9. A sample of 218 Grade 6 students was chosen from Max-Slevogt-Gymnasium (Landau), Otto-Hahn-Gymnasium Landau and Konrad-Adenauer-Realschule Landau, in the southwest part of Germany. The selected students have had English as a compulsory subject since Grade 5, that is for at least more than one year and thus they also have basic knowledge of English prepositions.

3.1.3 Study procedure

For the whole difficulty test that is the pilot study, all participants were given two booklets at random. The questions were printed on A4 paper and every two combined booklets were bound together. Due to a worked out coding system, different participants received the two booklets in different orders. That is, one student received the combined booklets Booklet I and Booklet II, and others received, for example, the combined booklets Booklet III and Booklet IV, or the combined booklets Booklet V and Booklet VI, or the combined booklets Booklet IX and Booklet I.

Every test lasted about 20 minutes and the students were allowed to ask for any unknown vocabulary. Meanwhile, in order to be able to later design the tests for the main study, students were asked to underline the words and phrases they did not know.

3.1.4 Analyses

In this pilot study, the pilot study was interested in the difficulty of each item. Generally speaking, for all the 153 items, the average mean was .39. The one-sample Kolmogorov-Smirnov test of the scores for all items in the pilot study showed that the data approximated a

normal distribution and the test for difficulty was significant (Skewness=.53, Kurtosis=-.71, Kolmogorov-Sminov *Z*=1.35, *p*=.053), which is set out below (see Figure 17a).

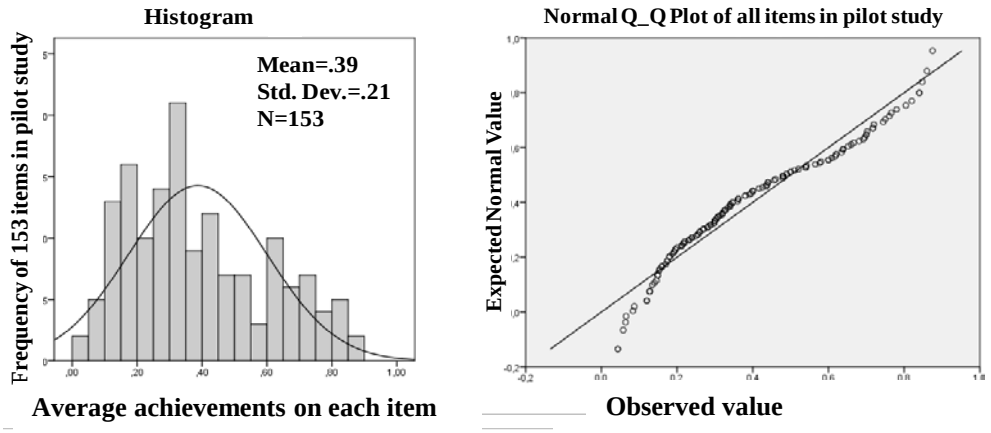


Figure 17a. Graph of the mean standardized scores of all items in the pilot study with a histogram figure and normal Q-Q figure

In part one, for all the 90 items, the average mean was .45. The one-sample Kolmogorov-Smirnov test of the scores for all items in the pilot study showed that the data approximately normally distributed and the test for difficulty was significant (Skewness=.27, Kurtosis=-1.23, Kolmogorov-Sminov *Z*=1.14, *p*=.15), which is set out below (see Figure 17b).

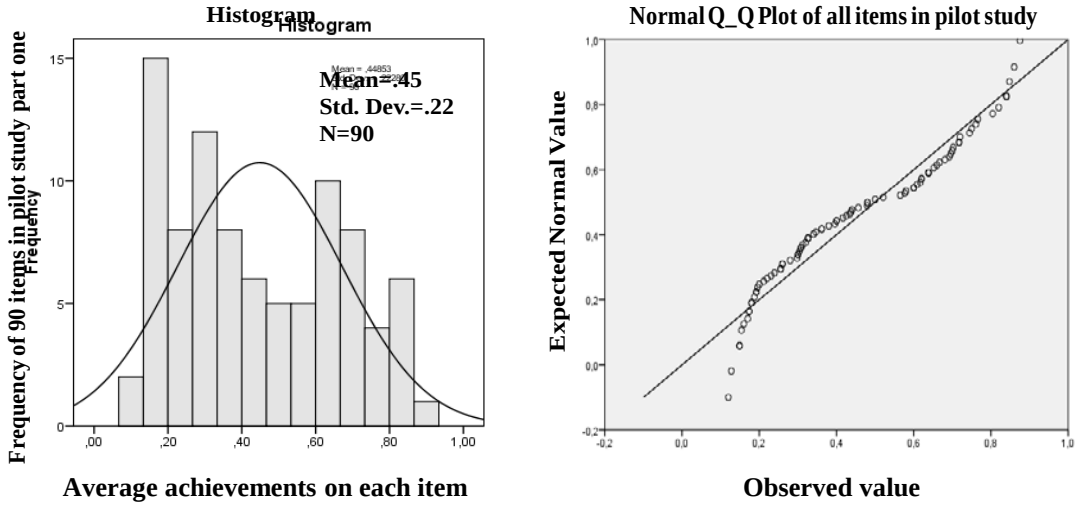


Figure 17b. Graph of the mean standardized scores of all items in part one of the pilot study with a histogram figure and normal Q-Q figure

The same analysis was also done for part two. For all the 63 items, the average mean was .30. The one-sample Kolmogorov-Smirnov test of the scores for all items in the pilot study showed that the data approximated a normal distribution and the test for difficulty was significant (Skewness=.60, Kurtosis=.17, Kolmogorov-Sminov *Z*=.55, *p*=.93) (see Figure 17c).

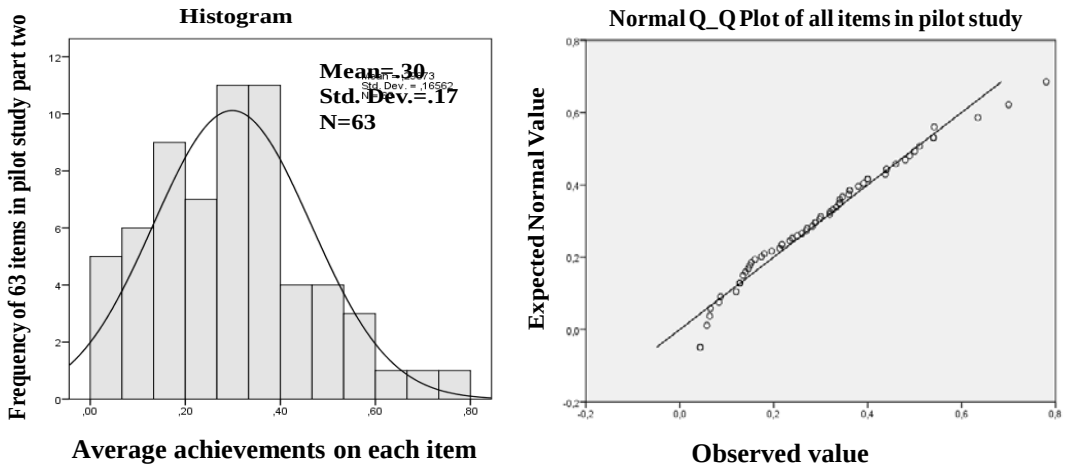


Figure 17c. Graph of the mean standardized scores of all items in part two of the pilot study with a histogram figure and normal Q-Q figure

Regarding the difficulty, the most difficult items were removed as well as the easiest items in order to avoid a ceiling effect and a floor effect. The rejected items referred to three items for *in*, *on* and *at* in the spatial domain, three items for *in*, *on* and *at* in the temporal domain, three items for *in*, *on* and *at* in the abstract domain and six items where *no preposition* was appropriate. The most difficult item could be identified in two and had an average mean of .04 (the item of *on strike* in the abstract domain) and the easiest item had the average mean of .78 (the item of *in your coffee* in the spatial domain). In the end, we kept 120 items including 12 no prepositions items and 108 items with one of the three English prepositions. In total, each preposition had 36 items across the three domains and the numbers of items in each domain were the same.

After arranging all the items' difficulties, three new test questions were designed which could be used for later experiment as the pre-test and the post-test. For the pre-test and the post-test, three different sets of questions (Test A, Test B, and Test C) were put together, which all tested the same content and were at the same level of difficulty. The difficulty of each new test was similar with the total average means at 17.05, 17.06 and 17.01. Especially, the sum of means in part one was 13.39, 13.09 and 13.22 and in part two was 3.66, 3.97 and 3.79. In other words, the main study concluded 120 items originating from the pilot study and every new test had two parts and a total of 40 items. Part one has 30 items and consists of a gap filling. Part two consists of 10 items where sentences with a proper combination of *in*, *on*, *at* or *no preposition* and phrase to be taken from a given table have to be completed. For each correct answer one point could be scored to a total score of 40 points with 30 points in part one and 10 points in part two.

3.1.5 Summary

The pilot study examined the difficulty of each item by testing German participants via nine booklets testing the three prepositions across the three domains. The results showed that the achievements of items (overall items, the items in part one and the items in part two) all approximated normal distributions and the test for difficulty was significant and reliable. After removing the most difficult items as well as the easiest items, the newly formed test could be used in the main study. The results also showed the low achievements for each item where the full mark of each item was 1.00 point whereas the average means of overall items was .39 (*SD*=.21) , the average means of items in part one was .45 (*SD*=.22) and the average means of items in part two was .30 (*SD*=.17). It indicated that understanding and using English prepositions is a challenge for German students. In addition, students performed better in the gap filling than in the complete sentences task. Regarding the different

measurements (e.g. gap filling in part one and complete sentences task in part two), results suggests that if the measurement was more familiar to students and required less operating, the students had better achievements.

3.2 Experimental Methods in the Main Study

3.2.1 Hypotheses

According to the four basic research questions, the present study attempts to examine the effectiveness of CL-inspired meaningful teaching of the English prepositions *in*, *on* and *at*. And the major hypotheses are presented as follows:

Hypothesis 1 (*H1*): within each track and between the two tracks, the experimental group using the CL-inspired approach for meaningful teaching would perform better in the post-test than the control group using the traditional approach for rote teaching.

Hypothesis 2 (*H2*): within each track and between the two tracks, the CL-inspired approach for meaningful teaching (applied in the experimental group) would be more successful in improving the achievements than the traditional approach for rote learning (applied in the control group) from the pre-test to the post-test.

Hypothesis 3 (*H3*): the deep-seated factors constraining the learning of English prepositions by rote learning vs. meaningful learning would be the same for learners at different proficiency levels.

These hypotheses cover the findings of overall items, the items within the three domains and the items referring to the three prepositions.

3.2.2 Material

The test material used the new test questions originating from the pilot study as difficulty test so that the experiment consisted of a pre-test and a post-test. For the pre-test

and the post-test, three different sets of questions (Test A, Test B, and Test C) were used. In order to keep the same pace of teaching English prepositions, the teaching material was compiled and designed based on the rote learning approach and the meaningful learning approach which allowed a comparison between students' performances of either traditional-oriented or CL-oriented instructions.

3.2.2.1 Design of test material

The experiment consisted of a pre-test and a post-test. The items in the pre-test and the post-test came from the pilot study. As a reminder, regarding the test questions for the pre-test and the post-test, there were test A, test B and test C which tested the same content and were at the same level of difficulty. The questions were printed on A4 paper.

3.2.2.2 Design of teaching material

In order to answer the question whether teaching prepositions on the basis of concepts from the field of CL is more efficient than traditional rote learning, the experimental group received learning material which introduced the basic principles underlying the use of corresponding propositions by the CL-inspired approach, whereas the control group received learning material according to the traditional way of learning prepositions by providing the general definitions and corresponding examples as dictionary-based rote learning methods.

The study comprised three lessons in the experimental group and three in the control group. Each lesson included the usages of *in*, *on* and *at*. The first lesson presented the spatial usages, the second lesson presented the temporal usages and the third lesson presented the abstract usages. In the following part, the usages of *in* were illustrated in different teaching materials for the experimental group and the control group. All material was presented to students by poster. After each lesson, the related exercises were printed out and given to the students, which in principle consisted of filling the gap, multiple choices, and matching

halves to complete sentences and were illustrated by both text and pictures. Both groups, although instructed differently, used the same exercises. Teachers checked their answers and explained differences to the students when they had finished their exercises. Details can be found in Appendix C, Appendix D and Appendix E.

A traditional approach to rote teaching

There is no simple one-to-one mapping between the prepositions in the mother tongue and the foreign language. Instead, the prevailing situation is a one-to-many mapping at both sides. As a result, teaching the usages of prepositions in a foreign language generally follows a rule-plus-exceptions approach: there are a few rules which can be applied in a number of cases. The predominant way of dealing with prepositions in a foreign language is therefore rote learning. The multiple senses of prepositions are usually presented in a dictionary-like style with distinct entries for the different meanings.

In the control condition of present study, the teaching material was based on traditional methods. Students received lists with different definitions of the prepositions (*in*, *on* and *at*) (cf. OALD, 2005) and corresponding examples for each target prepositions. The pictures relating to the target prepositions were also shown. To arrange for comparable teaching set-ups, the design based on the traditional approach comprised three lessons referring to the three domains (spatial, temporal, and abstract domain). But this classification has not made transparent to students. That is, this systematization remains opaque to students who have just learned three different sets of preposition. Table 4 presents the usages of *in* across the three domains including the definitions and related examples.

Table 4

The traditional approach for rote teaching in the present study: sample preposition in

Spatial **Domain**	at a point within an area or a space	-The kids are playing in the street. -I read about it in the paper.
	within the shape of something; surrounded by something	-She is sitting in an armchair. -leave the key in the lock.
 in Paris	 in the bottle	 in the car
Temporal **Domain**	during a period of time	-in 2005/August -in spring/summer/autumn/winter -in the morning/afternoon/evening
	after a particular length of time	-in a few minutes/ hours/ days/weeks…
 in summer	 in 2008	 in winter
Abstract **Domain**	forming the whole or part of something/somebody; contained within something/somebody	-There are 31 days in May. -I recognize his father in him.
	used to show a state or condition	-The house is in good repair. -Are you interested in art?

In the first lesson teaching the spatial usages of *in*, *on* and *at*, teachers explained the definitions in OALD (2005) of each target preposition and its matched examples. Then, with vivid pictures and related phrases, students were asked to try to make sentences on their own. The prepositions were taught in order of *in* firstly, *on* secondly and *at* the last one. The same order was applied across the three domains.

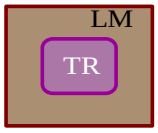
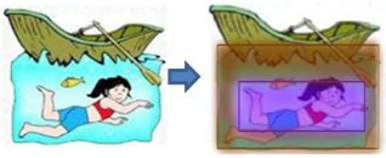
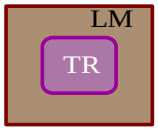
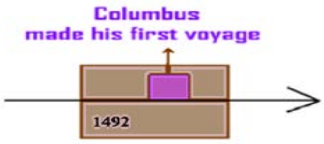
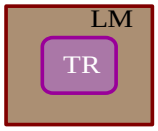
A CL-inspired approach to meaningful teaching

Based on the framework mentioned in part two, the specific example of *in* is illustrated below. The image schema of *in* is CONTAINMENT implying a container with a defined in-out orientation, a certain content and the notion of full or empty (cf. Evans, 2007). To illustrate

the CONTAINMENT image schema, in the teaching material the TR was colored purple as the central square and the LM is colored brown. This image schema was applied to the metaphorical mappings from the spatial domain to the temporal and the abstract domain (see Table 5).

Table 5

A cognitive linguistic approach to meaningful teaching in the present study: sample preposition in

Spatial domain			She is swimming in the sea.
Temporal domain			Columbus made his first voyage from Europe to America in 1492.
Abstract domain			In my opinion, the film wasn't very good.

The selected linguistic example within the spatial domain is *She is swimming in the sea*. Here *the sea* is the LM and *she is swimming* is the TR, which is spatially located in relation to the LM by means of the preposition *in*. Due to the basic image schema of *in*, i.e. CONTAINMENT, the LM denotes the concept of a container. In the temporal domain, the same image schema can also be used to explain the sentence *Columbus made his first voyage from Europe to America in 1492*. Here, the year *1492*, again the LM, is considered to be a container for the TR when *Columbus made his first voyage from Europe to America*. So, the basic image schema CONTAINMENT of the preposition *in*, is metaphorically mapped from

the spatial domain (source domain) to the temporal domain (target domain). Similarly, linguistic examples from the abstract domain can be illustrated. For instance, in the sentence *In my opinion, the film wasn't very good*, the TR *the film wasn't very good* is enclosed within *my opinion* (the LM), which is perceived as a container. So again, by metaphorical mapping, the basic image schema of the preposition *in* in the spatial domain (source domain) is used to understand its meaning in the abstract domain (target domain). In brief, the three sample sentences can be explained by the CL-inspired approach that the cognitive domain provides a coherent stable knowledge context of *in*, the CONTAINMENT schema illustrates the spatial relation by the TR and the LM as well as extends such concrete structure to the temporal and the abstract domains, and metaphorical mappings between conceptual domains (the source domain and the target domain) structure the abstract senses of *in*. Hence, this CL-inspired approach in the present study is applied to the teaching and learning of *in*, *on* and *at*.

In summary, focusing on the framework of the present study, the image schema CONTAINMENT of *in* is mapped from the spatial domain onto the temporal domain as well as from the spatial domain onto the abstract domain. In each domain, the sample sentences could be illustrated by the CONTAINMENT image schema which denotes the enclosed relationship between the TR and the LM. Through the metaphorical mappings from source domain onto target domain, students could acquaint the abstract concepts of the target prepositions.

3.2.3 Participants

There were two tracks in the present study. For the higher track participants from a German grammar school were selected whereas for the medium track participants from a comprehensive school were chose. The participants in the present study were split into an experimental group applying the CL-inspired meaningful learning approach and the control group following traditional rote learning.

For the higher track, a sample of 133 seventh-grade pupils was chosen from the Otto-Hahn-Gymnasium Landau, in the southwest part of Germany. The selected students have had English as a compulsory subject since grade 5, that is, for more than two years, and thus they also have basic knowledge of English prepositions.

For the medium track, a sample of 45 seventh-grade pupils was chosen from Konrad-Adenauer-Realschule Landau, a sample of 29 seventh-grade pupils was chosen from Erich Kästner Realschule Stutensee, and a sample of 11 seventh-grade pupils was chosen from Wasgauschule Hauenstein. All the schools are in the southwest part of Germany. Similar to the students in the higher track, the selected students in the medium track have had English as a compulsory subject since grade 5 and thus, have basic knowledge of English prepositions.

3.2.4 Procedure

For the whole experiment, all participants were given a pre-test, three lessons on English prepositions and a post-test. The type of the tests was a paper-and-pencil-test, which was printed on A4 paper. The teaching material was presented by poster. Every session consisted of about 20 minutes in each group.

The pre-test was carried out first. Teaching process started one week later. In the first week the lesson focused on the spatial domain, always incorporating all three prepositions. One week later, a lesson on the temporal domain was carried out and during the third week, the linguistic examples for the abstract domain were taught to the groups.

One week after the last session, the participants did a post-test and the overall achievements for the three selected English prepositions were measured. In this test, participants were given different test questions, but the procedure was exactly the same as in the pre-test. Overall, the experiment lasted for about five weeks.

4 Results of the Empirical Study

The data collated through the pre-test and the post-test introduced in part three was coded and was input into SPSS 21 to conduct statistical computation. In order to control for a comparable level of proficiency in the experimental and the control groups during the pre-test and the post-test, paring procedure took place within each track and between the two tracks. The participants who took both tests were taken into account.

According to the data within each track and between the two tracks, *H1* focusing on the achievements in the post-test was tested separately for the higher track, for the medium track and between the higher track and the medium track. In order to test *H1* within each track, the experimental group performed better in the post-test than the control group, one-factor ANCOVAs were computed with *group (experimental/control)* as a between factor, the post-test score as dependent variable and the pre-test score as control variable. In order to test *H1* between the two tracks, one-factor ANCOVAs which were computed with *track (the higher track/the medium track)* and with *group (experimental/control)* as between factors, the post-test score as dependent variable, and the pre-test score as control variable with a special focus on the interaction of *track* × *group.*

According to the data within each track and between the two tracks, *H2* focusing on the improvements from the pre-test to the post-test was tested separately for the higher track, for the medium track and between the higher track and the medium track. In order to test *H2* within each track, i.e. the experimental group improved more than the control group from pre-test to post-test, 2 (× 2)-ANOVAs were computed with the between-factor *group (experimental/control)* and the within-factor *learning (pre-test/post-test)* with a special focus on the interaction *group* × *learning*.

In order to test *H2* between the two tracks, 2 × 2 (× 2) ANCOVAs were computed with the within-factor *learning (pre-test/post-test)* and the between factors *track (higher track/*

medium track) and *group (experimental/control)* with a special focus on the interaction *learning* × *track* × *group*.

As the experimental group was expected to perform better in the post-test and to improve more from the pre-test to the post-test than the control group, the present study is interested in one-tailed tests that were computed both for the ANCOVAs and the ANOVAs.

Seeking for the deep-seated factors constraining the learning of English prepositions as well as exploring at which degree the deep-seated factors impact the knowledge acquisition, *H3* was tested focusing on the achievements in the post-test between the higher track and the medium track. Regarding the effects of the mother tongue, the achievements of the items transferring of correspondences from the mother tongue and the items having no correspondences from the mother tongue were considered separately. Whether the corresponding mother tongue items had better achievements was taken into account. The correlation analysis between the achievements of the items in the tests and the number of item corresponding to mother tongue translation items in the tests were computed. The correlation analysis between the achievements of the corresponding items in the tests and the number of the corresponding items in the test were computed as well. And furthermore the correlation within each track and between two tracks was considered.

4.1 Results of Hypothesis 1 Focusing on the Achievements in the Post-test

4.1.1 Results of the higher track

As a reminder, in this part, one-factor ANCOVAs were computed with *group (experimental/control)* as a between factor, the post-test score as dependent variable and the pre-test score as control variable. The results of the higher track were taken into account first. Focusing on different dependent variables, the data is reported in the following in the order of

(1) analysis of all items in total, (2) analysis of the items within the different domains (spatial, temporal, abstract), (3) analysis of the items with the three prepositions (*in*, *on*, *at*), and (4) analysis of the items referring to the three prepositions *in*, *on*, *at* across the spatial, the temporal and the abstract domain.

4.1.1.1 All items: total scores

Table 6a provides the means and standard deviations of the total scores in the pre-test and the post-test for the experimental group and the control group (raw data). Table 6b shows the corresponding means and standard deviations of the standardized values (z-scores). The means of the standardized scores are also shown graphically in Figure 18. According to Masson and Loftus (2003), the error bars in the present study represent the 95% of the interaction which is used to all the data analysis.

Table 6a

Means and standard deviations of the total scores in the pre-test and the post-test for the experimental and the control group (raw data) within the higher track

Dependent variables	**Higher track (*N*=133)**			
as overall items	Experimental group (*n*=80)		Control group (*n*=53)	
	M	*SD*	*M*	*SD*
Pre-test	18.98	4.22	20.30	4.32
Post-test	22.30	4.17	21.11	5.01

Table 6b

Means and standard deviations of the total standardized scores in the pre-test and the post-test for the experimental and the control group (z-scores) within the higher track

Dependent variables	**Higher track (*N*=133)**			
as overall items	Experimental group (*n*=80)		Control group (*n*=53)	
	M	*SD*	*M*	*SD*
Pre-test	-.12	.98	.19	1.01
Post-test	.65	.97	.37	1.17

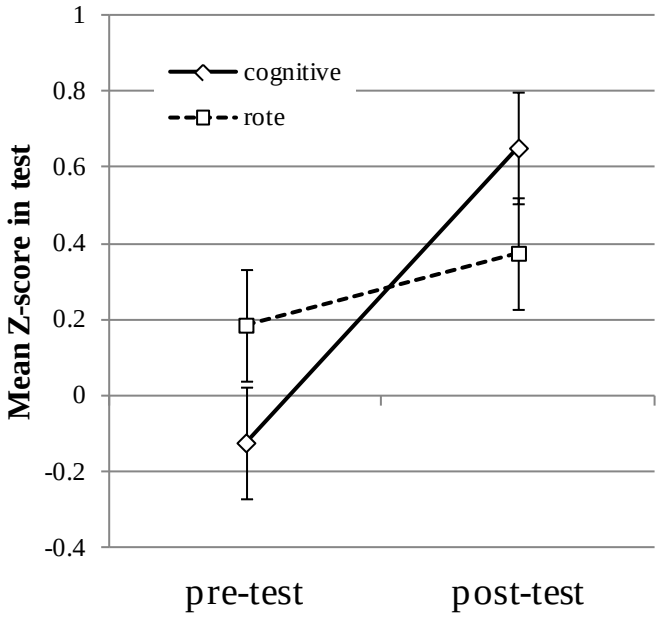


Figure 18. Graph of the mean standardized total scores in the pre-test and the post-test for the experimental and the control group (z-scores, error bars represent the 95% of the interaction of the pre-post and training group computed according to Masson & Loftus, 2003)

The one-factor ANCOVA of the post-test (with the pre-test as co-variate) revealed a significant effect of *group* on the post-test scores ($F(1, 131)=4.37$, $p=.02$, $\eta^2=.03$). In other

words, when controlled for pre-test scores, the experimental group performed significantly better in the post-test than the control group.

4.1.1.2 Items within the three domains (spatial, temporal, abstract)

The means and standard deviations of the scores of the items in the three domains in the pre-test and the post-test for the experimental group and the control group (raw data) are displayed in Table 7a. The corresponding means and standard deviations of the standardized values (z-scores) are shown in Table 7b. Figure 19 displays the means of the standardized scores of the items in the three domains graphically.

Table 7a

Means and standard deviations of the scores of the items in the three domains in the pre-test and the post-test for the experimental and the control group (raw data) within the higher track

Dependent variables	**Higher track (*N*=133)**			
as items for domains	Experimental group (*n*=80)		Control group (*n*=53)	
	M	*SD*	*M*	*SD*
Spatial domain				
Pre-test	6.69	1.67	7.49	2.05
Post-test	7.70	1.83	7.45	2.09
Temporal domain				
Pre-test	6.64	1.88	6.81	1.80
Post-test	7.64	1.69	7.09	2.02
Abstract domain				
Pre-test	4.21	1.77	4.25	1.70
Post-test	5.95	1.62	5.43	1.73

Table 7b

Means and standard deviations of the standardized scores of the items in the three domains in the pre-test and the post-test for the experimental and the control group (z-scores) within the higher track

Dependent variables as items for domains	**Higher track (*N*=133)**			
	Experimental group (*n*=80)		control group (*n*=53)	
	M	*SD*	*M*	*SD*
Spatial domain				
Pre-test	-.17	.90	.26	1.10
Post-test	.37	.98	.24	1.12
Temporal domain				
Pre-test	-.04	1.02	.06	.97
Post-test	.50	.91	.21	1.10
Abstract domain				
Pre-test	-.01	1.02	.01	.98
Post-test	.99	.93	.70	1.00

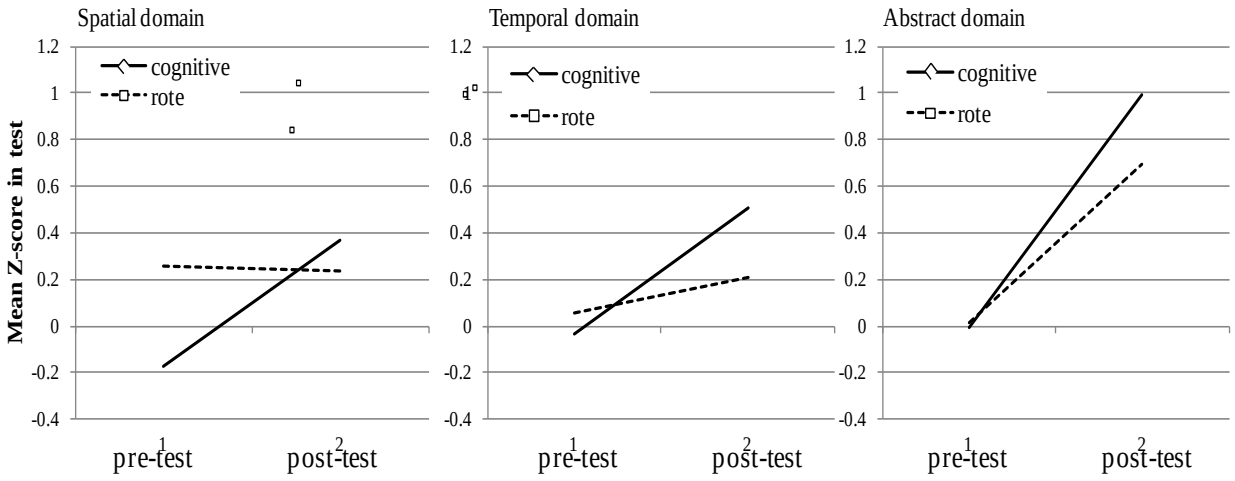


Figure 19. Graph of the mean standardized scores of the items in the three domains in the pre-test and the post-test for the experimental and the control group (z-scores)

The one-factor ANCOVA of the scores for the items in the spatial domain (with the pre-test as co-variate) showed that the experimental group performed better than the control group. However, this effect was not significant ($F(1, 131)=1.36$, $p=.12$, $\eta^2=.01$). Nevertheless, the ANCOVA for the two other domains revealed that the experimental group performed significantly better than the control group in the temporal domain ($F(1, 131)=3.10$, $p=.04$, $\eta^2=.02$) and also significantly better in the abstract domain ($F(1, 131)=3.29$, $p=.04$, $\eta^2=.03$). When controlled for the pre-test scores in the temporal and in the abstract domain, the experimental group performed significantly better in the post-test than the control group. The experimental group did not significantly outperform the control group in the spatial domain, although the experimental group scores were higher.

4.1.1.3 Items with the three prepositions (*in, on, at*)

Table 8 provides the scores of the items referring to the three prepositions in the pre-test and the post-test for the experimental group and the control group regarding the means and standard deviations (the raw data are displayed in Table 8a) as well as the corresponding

means and standard deviations of the standardized values of (the z-scores data are shown in Table 8b). See Figure 20 for a graphical representation based on the standardized scores.

Table 8a

Means and standard deviations of the scores of the items with three prepositions in the pre-test and the post-test for the experimental and the control group (raw data) within the higher track

Dependent variables	**Higher track (*N*=133)**			
as items for prepositions	Experimental group (*n*=80)		Control group (*n*=53)	
	M	*SD*	*M*	*SD*
In				
Pre-test	5.74	1.89	6.53	1.89
Post-test	7.46	1.67	6.66	2.34
On				
Pre-test	5.73	1.54	5.58	2.08
Post-test	6.34	1.94	6.13	1.75
At				
Pre-test	6.08	1.87	6.43	2.10
Post-test	7.49	1.83	7.19	2.03

Table 8b

Means and standard deviations of the standardized scores of the items with three prepositions in the pre-test and the post-test for the experimental and the control group (z-scores) within the higher track

Dependent variables as items for prepositions	**Higher track (*N*=133)**			
	Experimental group (*n*=80)		Control group (*n*=53)	
	M	*SD*	*M*	*SD*
In				
Pre-test	-.16	.98	.25	.98
Post-test	.73	.87	.32	1.22
On				
Pre-test	.03	.87	-.08	1.18
Post-test	.38	1.10	.26	.99
At				
Pre-test	-.07	.95	.11	1.07
Post-test	.65	.93	.49	1.03

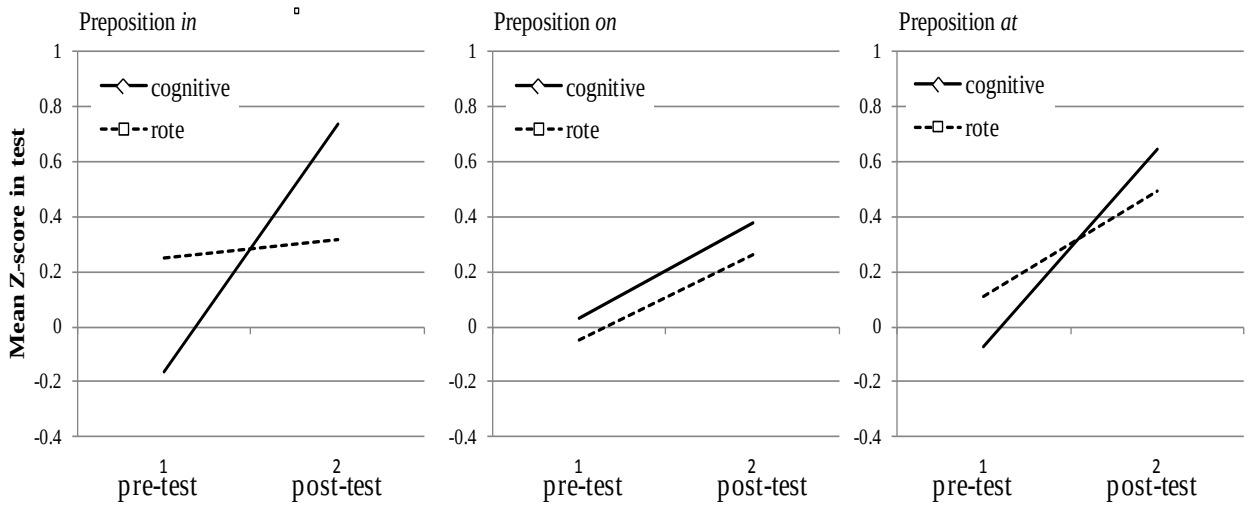


Figure 20. Graph of the mean standardized scores of the items with three prepositions in the pre-test and the post-test for the experimental and the control group (z-scores)

ANCOVAs were used to test the effects of *group* on the post-test with different prepositions (with the pre-test as co-variate). These analyses revealed a highly significant effect of the post-test scores for *in* with $F(1, 131)=9.16$, $p=.0015$, $\eta^2=.07$, a non-significant effect of *on* with $F(1, 131)=.32$, $p=.29$, $\eta^2=.00$ and a non-significant effect of *at* $F(1, 131)=.88$, $p=.18$, $\eta^2=.01$. In short, the experimental group performed significantly better in the post-test than the control group on the items with *in*. However, for the items *on* and *at*, the experimental group did not show significantly better performance.

4.1.1.4 Items of the three prepositions (*in, on, at*) across three domains

In order to explore the relationship between English prepositions and different domains, more detailed data from the experimental group and the control group are reported.

Items of *in* in the three domains

Table 9a provides the means and standard deviations of the scores of *in* across the three domains in the pre-test and the post-test for the experimental group and the control group (raw data). Table 9b shows the corresponding means and standard deviations of the

standardized values (z-scores). The means of the standardized scores are also shown graphically in Figure 21.

Table 9a

Means and standard deviations of the scores of in within the three domains in the pre-test and the post-test for the experimental and the control group (raw data) within the higher track

Dependent variables as detailed items of *in*	**Higher track (*N*=133)**			
	Experimental group (*n*=80)		Control group (*n*=53)	
	M	*SD*	*M*	*SD*
***In* spatial**				
Pre-test	2.26	.95	2.53	1.05
Post-test	2.70	.93	2.40	1.06
***In* temporal**				
Pre-test	2.06	1.16	2.34	1.00
Post-test	2.61	.89	2.45	1.10
***In* abstract**				
Pre-test	1.41	.95	1.66	.96
Post-test	2.39	1.13	1.81	1.04

Table 9b

Means and standard deviations of standardized scores of in within the three domains in the pre-test and the post-test for the experimental and the control group (z-scores) within the higher track

Dependent variables as detailed items of *in*	**Higher track (*N*=133)**			
	Experimental group (*n*=80)		Control group (*n*=53)	
	M	*SD*	*M*	*SD*
***In* spatial**				
Pre-test	-.11	.96	.16	1.05
Post-test	.33	.94	.03	1.07
***In* temporal**				
Pre-test	-.10	1.05	.15	.90
Post-test	.53	.88	.25	1.00
***In* abstract**				
Pre-test	-.10	.99	.16	1.00
Post-test	.51	.94	.31	1.08

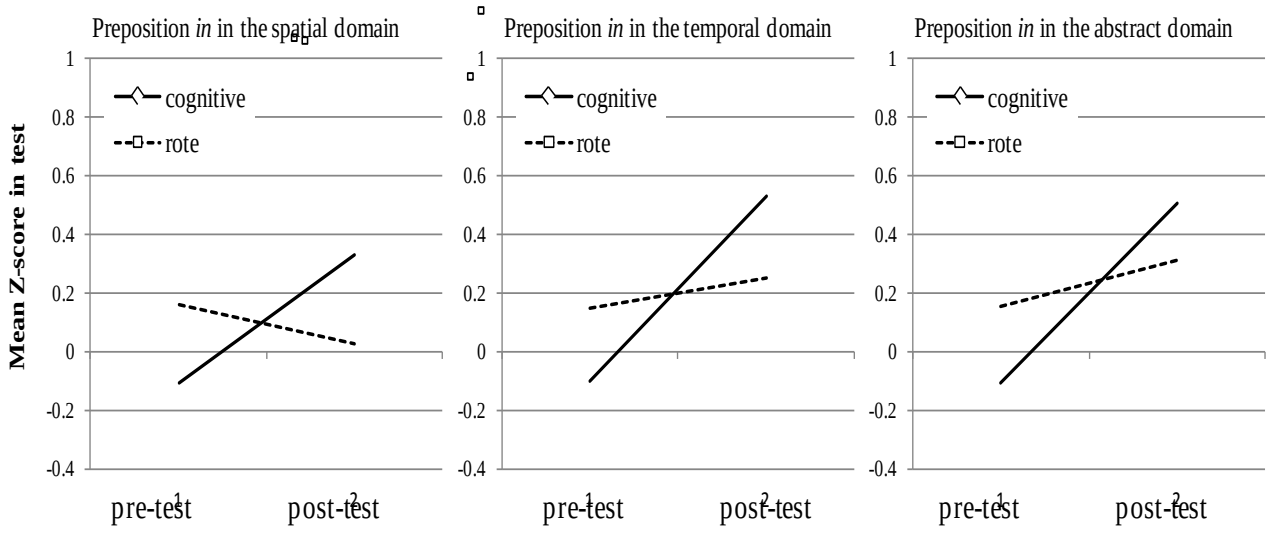


Figure 21. Graph of the mean standardized scores of *in* items within the three domains in the pre-test and the post-test for the experimental and the control group (z-scores)

Based on the effect of *group* on the post-test with *in* items across the three domains (with the pre-test as co-variate) computed by one-factor ANCOVA, a significant effect was found in the spatial domain *(*$F(1, 131)=3.00$, $p=.043$, $\eta^2=.02$) as well as in the temporal domain ($F(1, 131)=3.72$, $p=.028$, $\eta^2=.03$), and a marginally significant effect was revealed in the abstract domain ($F(1, 131)=1.69$, $p=.098$, $\eta^2=.01$). In other words, when controlled for the pre-test scores, the experimental group performed significantly better in the post-test than the control group regarding *in* items within the spatial and the temporal domain, and marginally significantly better than the control group on the items within the abstract domain.

Items of *on* in the three domains

Table 10 displays the means and standard deviations of the scores of *on* within the three domains in the pre-test and the post-test for the experimental group and the control group (raw data in Table 10a) as well as the corresponding means and standard deviations of the standardized values (z-scores in Table 10b). The means of the standardized scores are also shown graphically in Figure 22.

Table 10a

Means and standard deviations of the scores of on within the three domains in the pre-test and the post-test for the experimental and the control group (raw data) within the higher track

Dependent variables	**Higher track (*N*=133)**			
as detailed items of *on*	Experimental group (*n*=80)		Control group (*n*=53)	
	M	*SD*	*M*	*SD*
***On* spatial**				
Pre-test	2.50	.94	2.75	.90
Post-test	2.76	.97	2.74	.88
***On* temporal**				
Pre-test	1.91	.80	1.68	1.05
Post-test	2.18	.95	2.04	.92
***On* abstract**				
Pre-test	1.31	1.07	1.15	1.01
Post-test	2.70	.77	1.36	.94

Table 10b

Means and standard deviations of the standardized scores of on within the three domains in the pre-test and the post-test for the experimental and the control group (z-scores) within the higher track

Dependent variables as detailed items of *on*	**Higher track (*N*=133)**			
	Experimental group (*n*=80)		Control group (*n*=53)	
	M	*SD*	*M*	*SD*
***On* spatial**				
Pre-test	-.11	1.01	.16	.97
Post-test	.01	.96	.14	.95
***On* temporal**				
Pre-test	.10	.88	.15	1.15
Post-test	.39	1.04	.24	1.01
***On* abstract**				
Pre-test	.06	1.03	-.09	.96
Post-test	.29	.90	.11	.90

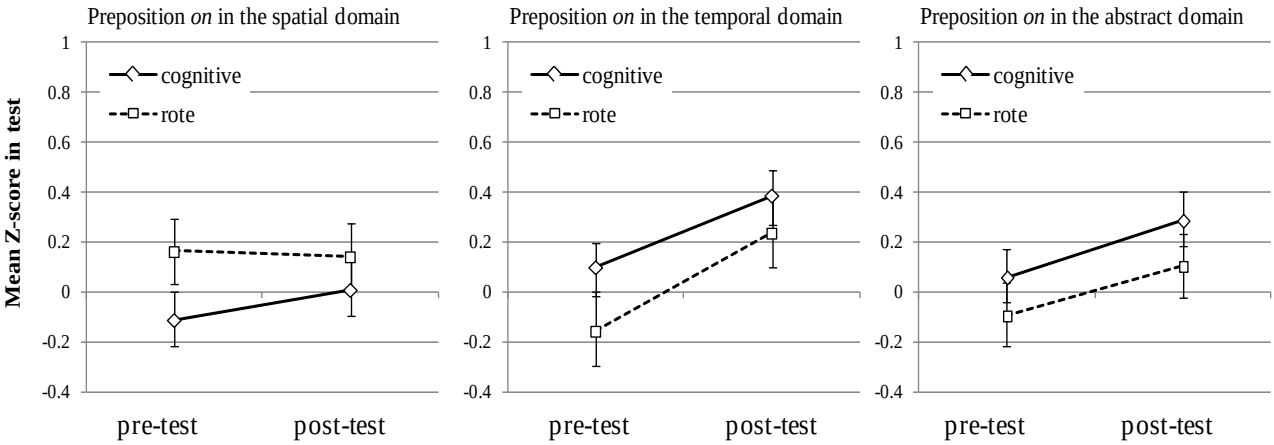


Figure 22. Graph of the mean standardized scores of *on* items across three domains in the pre-test and the post-test for the experimental and the control group (z-scores)

In the one-factor ANCOVAs, non-significant effects of *group* on the post-test (with the pre-test as co-variate) were uncovered with $F(1, 131)=.42$, $p=.26$, $\eta^2=.00$ for the spatial domain, $F(1, 131)=.57$, $p=.23$, $\eta^2=.00$ for the temporal domain, and $F(1, 131)=1.20$, $p=.14$, $\eta^2=.01$ for the abstract domain. In other words, the experimental group did not outperform the control group significantly. In the spatial domain, the control group performed better than the experimental group. On the contrary, in the temporal and the abstract domain, the experimental group performed better.

Items of *at* within the three domains

Table 11a provides the means and standard deviations of the scores of *at* across the three domains in the pre-test and the post-test for the experimental group and the control group (raw data). Table 11b shows the corresponding means and standard deviations of the standardized values (z-scores). The means of the standardized scores are also shown graphically in Figure 23.

Table 11a

Means and standard deviations of the scores of at within the three domains in the pre-test and the post-test for the experimental and the control group (raw data) within the higher track

Dependent variables as detailed items of *at*	**Higher track (*N*=133)**			
	Experimental group (*n*=80)		Control group (*n*=53)	
	M	SD	M	SD
***At* spatial**				
Pre-test	1.93	1.03	2.21	1.15
Post-test	2.00	.90	2.32	1.12
***At* temporal**				
Pre-test	2.66	.87	2.79	.88
Post-test	1.55	.94	2.60	1.01
***At* abstract**				
Pre-test	1.49	.80	1.43	.99
Post-test	2.40	.89	2.26	.88

Table 11b

Means and standard deviations of standardized scores of at within the three domains in the pre-test and the post-test for the experimental and the control group (z-scores) within the higher track

Dependent variables	**Higher track (*N*=133)**			
as detailed items of *at*	Experimental group (*n*=80)		Control group (*n*=53)	
	M	SD	M	SD
***At* spatial**				
Pre-test	-.10	.95	.16	1.06
Post-test	.32	1.04	.26	1.02
***At* temporal**				
Pre-test	-.06	.99	-.15	1.01
Post-test	-.02	.88	-.13	1.15
***At* abstract**				
Pre-test	.02	.91	-.04	1.13
Post-test	1.07	1.02	.91	1.01

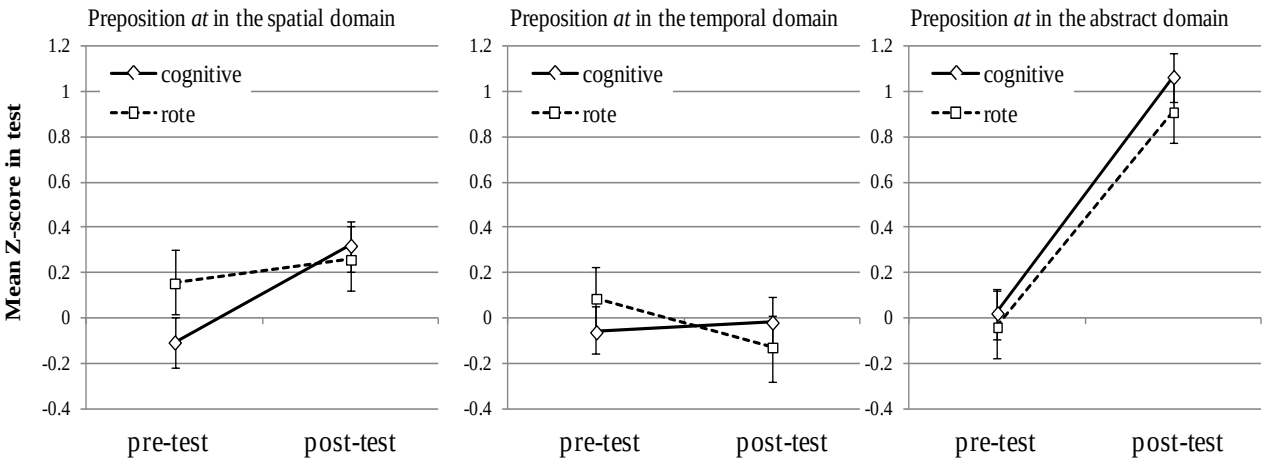


Figure 23. Graph of the mean standardized scores of *at* items across the three domains in the pre-test and the post-test for the experimental and the control group (z-scores)

Based on the effect of *group* on the post-test with *at* items within the three domains (with the pre-test as co-variate) computed by one-factor ANCOVAs, non-significant effects were found in the spatial domain *(*$F(1, 131)=.26$, $p=.31$, $\eta^2=.00$) as well as in the temporal domain ($F(1, 131)=.44$, $p=.25$, $\eta^2=.00$) and the abstract domain ($F(1, 131)=.76$, $p=.19$, $\eta^2=.01$). In other words, when controlled for the pre-test scores, the experimental group did not perform significantly better than the control group in the post-test regarding to *at* items within the spatial, the temporal and the abstract domain, although the experimental group had higher scores.

4.1.1.5 Summary

In Table 12, the comparisons between the experimental and the control group are summarized from the perspective of the two hypotheses that the experimental group would outperform the control group in terms of achievements in the post-test (*H1*). If a hypothesis was supported, the matched answer is “Yes” marked at different significant levels. Otherwise, if the hypothesis was not supported, the answer is “No”.

Table 12

The significance of achievements of experimental group in the post-test (the higher track)

	Spatial domain	Temporal domain	Abstract domain	**Prepositions across the three domains**
In	Yes**	Yes**	Yes*	**Yes***
On	No	Yes	Yes	**Yes**
At	Yes	Yes	Yes	**Yes**
Domains referring to three prepositions	**Yes**	**Yes****	**Yes****	**Overall items: Yes****

*p<.10, one-tailed. **p<.05, one-tailed. ***p<.01, one-tailed. ****p<.001, one-tailed.

Generally speaking, *H1* was supported for all items focusing on total scores at a significant level. Focusing on the three domains, the experimental group showed better achievements than the control group. And in the temporal and the abstract domain, the experimental group showed significant superiority. Focusing on all three prepositions, the experimental group also performed better than the control group. For the *in* items, the effect was highly significant, whereas it was not significant for the *on* and *at* items. Regarding the items of *in* across the spatial, the temporal and the abstract domain, the experimental group all performed significantly better. Regarding the *on* items in the spatial domain, the control group displayed non-significantly better achievement than the experimental group, whereas the experimental group performed non-significantly better in the temporal and the abstract

domain. For the items referring to *at*, the experimental group performed better than the control group across all the three domains, but the differences were not significant.

In short, apart from the *on* items within the spatial domain, the experimental group performed better in the post-test than the control group. And the significances were most pronounced across all items, items in the temporal and the abstract domain, and the items of *in* (across the spatial, the temporal and the abstract domain). In addition, except for the *on* items within the temporal domain, the experimental group performed better than the control group in the post-test.

4.1.2 Results of the medium track

The same analysis measures were also implemented in the medium track. One-factor ANCOVAs were computed with *group (experimental/control)* as a between factor, the post-test score as dependent variable and the pre-test score as control variable, which are reported in the following in the order of (1) analysis of all items in total, (2) analysis of the items within the different domains (spatial, temporal, abstract), (3) analysis of the items with the three prepositions (*in*, *on*, *at*), and (4) analysis of the items of the three prepositions *in*, *on*, *at* across the spatial, the temporal and the abstract domain.

4.1.2.1 All items: total scores

Table 13a provides the means and standard deviations of the total scores in the pre-test and the post-test for the experimental group and the control group (raw data). Table 13b shows the corresponding means and standard deviations of the standardized values (z-scores). The means of the standardized scores are also shown graphically in Figure 24.

Table 13a

Means and standard deviations of the total scores in the pre-test and the post-test for the experimental and the control group (raw data) within the medium track

Dependent variables	**Medium track (*N*=85)**			
as overall items	Experimental group (*n*=50)		Control group (*n*=35)	
	M	*SD*	*M*	*SD*
Pre-test	15.20	4.02	15.86	5.29
Post-test	15.84	4.74	17.6	4.91

Table 13b

Means and standard deviations of the total standardized scores in the pre-test and the post-test for the experimental and the control group (z-scores) within the medium track

Dependent variables	**Medium track (*N*=85)**			
as overall items	Experimental group (*n*=50)		Control group (*n*=35)	
	M	*SD*	*M*	*SD*
Pre-test	-.06	.88	.08	1.16
Post-test	.08	1.04	.47	1.08

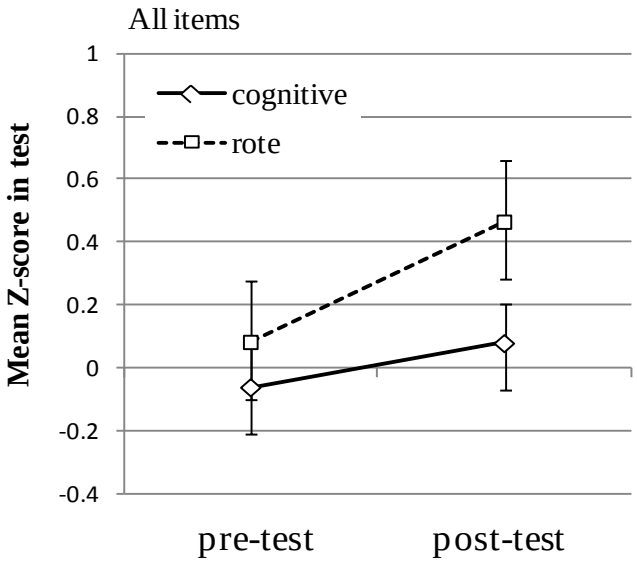


Figure 24. Graph of the mean standardized total scores in the pre-test and the post-test for the experimental and the control group (z-scores)

The one-factor ANCOVA of the post-test (with the pre-test as co-variate) revealed a marginally significant effect of *group* on the post-test scores ($F(1, 83)=2.40$, $p=.06$, $\eta^2=.03$). In other words, when controlled for the pre-test scores, the control group performed significantly better in the post-test than the experimental group. *H1* was not supported.

4.1.2.2 Items within the three domains (spatial, temporal, abstract)

The means and standard deviations of the scores of the items in the three domains in the pre-test and the post-test for the experimental group and the control group (raw data) are displayed in Table 14a. The corresponding means and standard deviations of the standardized values (z-scores) are shown in Table 14b. Figure 25 displays the means of the standardized scores of the items in the three domains graphically.

Table 14a

Means and standard deviations of the scores of the items in the three domains in the pre-test and the post-test for the experimental and the control group (raw data) within the medium track

Dependent variables as items for domains	**Medium track (*N*=85)**			
	Experimental group (*n*=50)		control group (*n*=35)	
	M	*SD*	*M*	*SD*
Spatial domain				
Pre-test	5.08	1.72	5.43	2.52
Post-test	5.48	2.06	6.4	2.29
Temporal domain				
Pre-test	5.40	1.99	5.40	1.87
Post-test	5.26	1.93	5.83	1.93
Abstract domain				
Pre-test	3.90	1.81	3.91	1.84
Post-test	4.34	1.90	4.06	1.57

Table 14b

Means and standard deviations of the standardized scores of the items in the three domains in the pre-test and the post-test for the experimental and the control group (z-scores) within the medium track

Dependent variables as items for domains	**Medium track (*N*=85)**			
	Experimental group (*n*=50)		control group (*n*=35)	
	M	*SD*	*M*	*SD*
Spatial domain				
Pre-test	-.07	.83	.10	1.21
Post-test	.12	.99	.56	1.10
Temporal domain				
Pre-test	.00	1.03	.00	.97
Post-test	-.07	1.00	.22	1.00
Abstract domain				
Pre-test	.00	1.00	.00	1.02
Post-test	.24	1.05	.08	.87

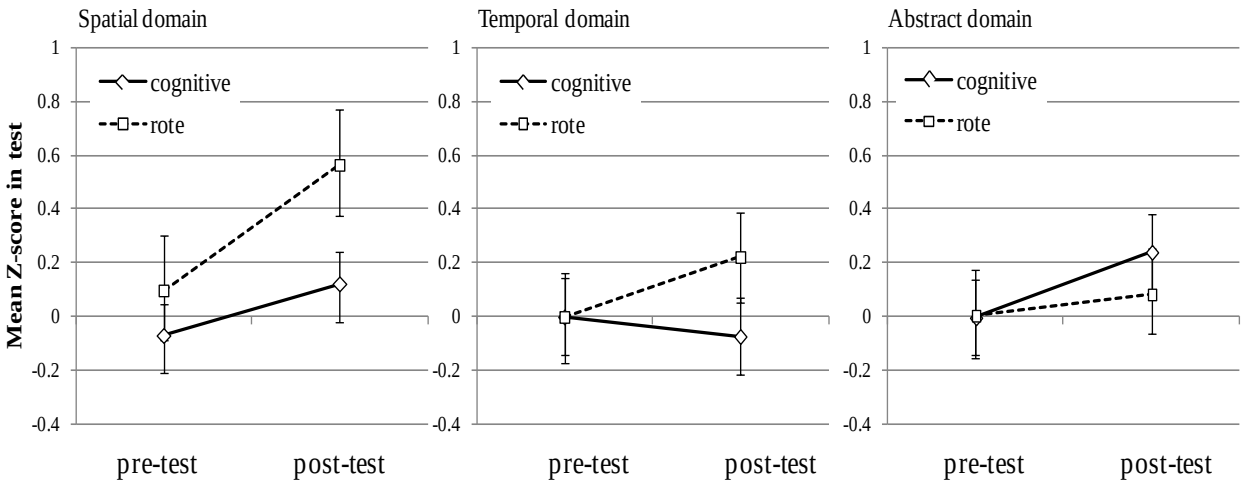


Figure 25. Graph of the mean standardized scores of the items in the three domains in the pre-test and the post-test for the experimental and the control group (z-scores)

The one-factor ANCOVA of the scores for the items in the spatial domain (with the pre-test as co-variate) revealed a marginally significant effect of *group* on the post-test scores that the control group performed marginally significantly more than the experimental group ($F(1, 83)=3.27$, $p=.04$, $\eta^2=.04$). In the temporal domain, the one-factor ANCOVA also revealed a marginally significant effect of *group* that the control group performed marginally significantly more than the experimental group ($F(1, 83)=1.77$, $p=.09$, $\eta^2=.02$). In the abstract domain, the one-factor ANCOVA displayed that there was a non-significant effect of *group* ($F(1, 83)=.52$, $p=.24$, $\eta^2=.01$), although the experimental group outperformed the control group. In other words, when controlled for the pre-test scores, the experimental group did not perform significantly better in the post-test than the control group in the spatial, the temporal and the abstract domain. On the contrary, the control group performed more significantly than the experimental group in the spatial and the temporal domain. In the abstract domain, the experimental group performed better than the control group but not significantly.

4.1.2.3 Items with the three prepositions (*in, on, at*)

Table 15 provides the scores of the items referring to the three prepositions in the pre-test and the post-test for the experimental group and the control group regarding the means and standard deviations (the raw data are displayed in Table 15a) as well as the corresponding means and standard deviations of the standardized values of (the z-scores data are shown in Table 15b). See Figure 26 for a graph based on the standardized scores.

Table 15a

Means and standard deviations of the scores of the items with the three prepositions in the pre-test and the post-test for the experimental and the control group (raw data) within the medium track

Dependent variables	**Medium track (*N*=85)**			
as items for prepositions	Experimental group (*n*=50)		control group (*n*=35)	
	M	*SD*	*M*	*SD*
In				
Pre-test	4.74	1.90	4.71	1.90
Post-test	5.72	2.30	5.37	2.09
On				
Pre-test	4.86	1.73	4.86	1.57
Post-test	4.40	2.00	5.20	1.78
At				
Pre-test	4.78	1.90	5.17	2.53
Post-test	4.96	1.99	5.71	2.31

Table 15b

Means and standard deviations of the standardized scores of the items with the three prepositions in the pre-test and the post-test for the experimental and the control group (z-scores) within the medium track

Dependent variables as items for prepositions	**Medium track (*N*=85)**			
	Experimental group (*n*=50)		control group (*n*=35)	
	M	*SD*	*M*	*SD*
In				
Pre-test	.01	1.01	-.01	1.01
Post-test	.52	1.22	.34	1.10
On				
Pre-test	.00	1.04	-.00	.95
Post-test	-.28	1.21	.21	1.07
At				
Pre-test	-.07	.87	.11	1.16
Post-test	.01	.92	.36	1.06

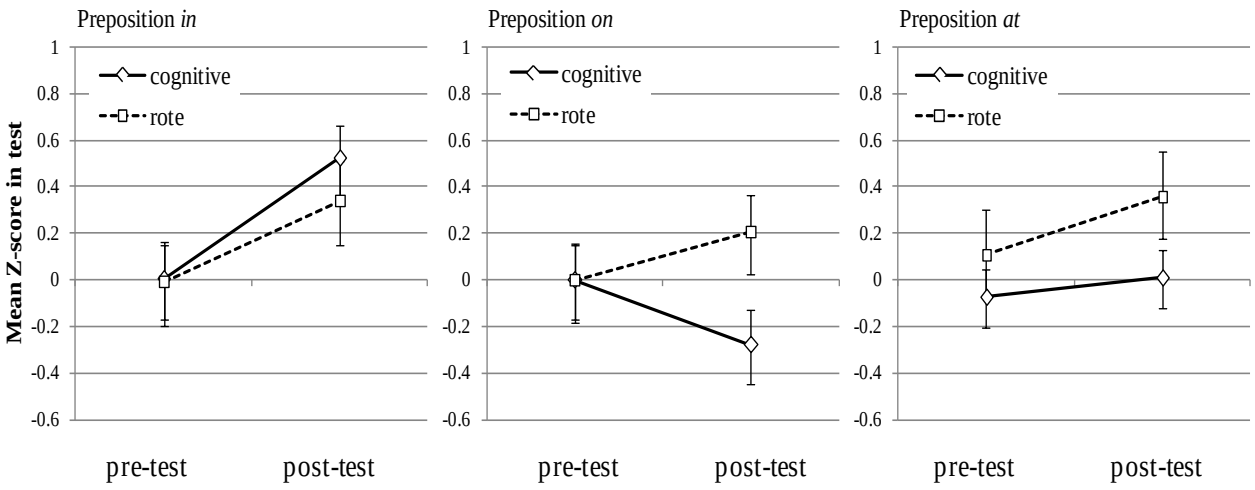


Figure 26. Graph of the mean standardized scores of the items with three prepositions in the pre-test and the post-test for the experimental and the control group (z-scores)

The one-factor ANCOVA revealed a non-significant effect of *group* of the post-test scores for the *in* items with $F(1, 83)=.51$, $p=.24$, $\eta^2=.01$, a significant effect of the *on* items with $F(1, 83)=3.58$, $p=.03$, $\eta^2=.04$ and a marginally significant effect of the *at* items ($F(1, 83)=2.02$, $p=.08$, $\eta^2=.02$). In short, the experimental group did not perform significantly better in the post-test than the control group on the items *in*, *on* and *at*. Focusing on the items of *in*, the experimental group outperformed the control group but with no significance. Focusing on the items of *on* and *at*, the control group performed significantly better than the experimental group.

4.1.2.4 Items of the three prepositions (*in, on, at*) across three domains

In order to explore the deep relationship among English prepositions and different domains, more detailed data from the experimental group and the control group are reported.

Items of *in* in the three domains

Table 16a provides the means and standard deviations of the scores of items *in* within the three domains in the pre-test and the post-test for the experimental group and the control

group (raw data). Table 16b shows the corresponding means and standard deviations of the standardized values (z-scores). The means of the standardized scores are also shown graphically in Figure 27.

Table 16a

Means and standard deviations of the scores of in within the three domains in the pre-test and the post-test for the experimental and the control group (raw data) within the medium track

Dependent variables as detailed items of *in*	**Medium track (*N*=85)**			
	Experimental group (*n*=50)		control group (*n*=35)	
	M	*SD*	*M*	*SD*
***In* spatial**				
Pre-test	1.92	.90	1.83	1.10
Post-test	2.34	1.02	2.23	1.14
***In* temporal**				
Pre-test	1.64	1.16	1.71	.96
Post-test	1.56	1.16	1.97	.95
***In* abstract**				
Pre-test	1.12	.92	1.31	.87
Post-test	1.54	1.05	1.77	1.21

Table 16b

Means and standard deviations of the standardized scores of in within the three domains in the pre-test and the post-test for the experimental and the control group (z-scores) within the medium track

Dependent variables	**Medium track *(N*=85)**			
as detailed items of *in*	Experimental group (*n*=50)		control group (*n*=35)	
	M	*SD*	*M*	*SD*
***In* spatial**				
Pre-test	.04	.92	-.05	1.12
Post-test	.47	1.04	.35	1.16
***In* temporal**				
Pre-test	-.03	1.08	.04	.89
Post-test	.29	.97	.33	1.19
***In* abstract**				
Pre-test	-.09	1.02	.13	.97
Post-test	.31	1.15	.38	1.39

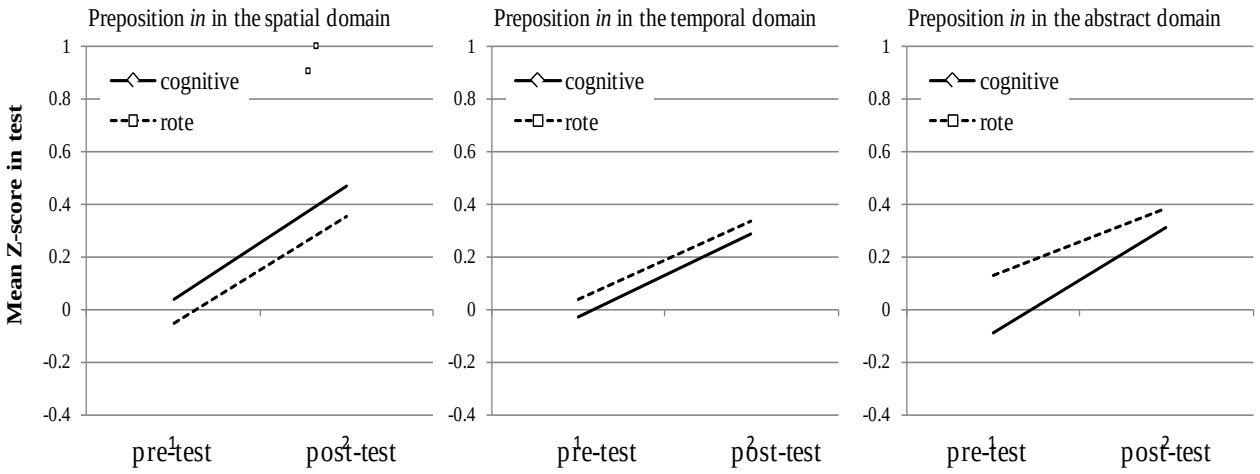


Figure 27. Graph of the mean standardized scores of *in* items within the three domains in the pre-test and the post-test for the experimental and the control group (z-scores)

In the one-factor ANCOVA, a non-significant effect of *group* of the post-test with different prepositions (with the pre-test as co-variate) was uncovered with $F(1, 83)=.18$, $p=.34$, $\eta^2=.00$ in the spatial domain as well as $F(1, 83)=.04$, $p=.43$, $\eta^2=.00$ in the temporal domain and $F(1, 83)=.02$, $p=.45$, $\eta^2=.00$ in the abstract domain. In other words, the experimental group did not outperform the control group significantly. Moreover, in the spatial domain, the control group performed better than the experimental group. Oppositely, in the temporal and the abstract domain, the experimental group performed better.

Items of *on* in the three domains

Table 17a provides the means and standard deviations of the scores of *on* within the three domains in the pre-test and the post-test for the experimental group and the control group (raw data). Table 17b shows the corresponding means and standard deviations of the standardized values (z-scores). The means of the standardized scores are also shown graphically in Figure 28.

Table 17*a*

Means and standard deviations of the scores of on within the three domains in the pre-test and the post-test for the experimental and the control group (raw data) within the medium track

Dependent variables	**Medium track (*N*=85)**			
as detailed items of *on*	Experimental group (*n*=50)		control group (*n*=35)	
	M	*SD*	*M*	*SD*
***On* spatial**				
Pre-test	1.94	1.02	2.03	1.15
Post-test	1.98	1.04	2.03	1.20
***On* temporal**				
Pre-test	1.70	1.04	1.60	.74
Post-test	1.48	1.13	1.60	.98
***On* abstract**				
Pre-test	1.20	.95	1.29	.89
Post-test	1.44	1.01	1.91	1.20

Table 17b

Means and standard deviations of the standardized scores of on within the three domains in the pre-test and the post-test for the experimental and the control group (z-scores) within the medium track

Dependent variables as detailed items of *on*	**Medium track (*N*=85)**			
	Experimental group (*n*=50)		control group (*n*=35)	
	M	*SD*	*M*	*SD*
***On* spatial**				
Pre-test	-.03	.95	.05	1.08
Post-test	-.39	1.09	-.01	.89
***On* temporal**				
Pre-test	.05	1.13	-.06	.80
Post-test	-.19	1.23	-.06	1.06
***On* abstract**				
Pre-test	-.04	1.03	.05	.97
Post-test	.53	1.39	.74	1.07

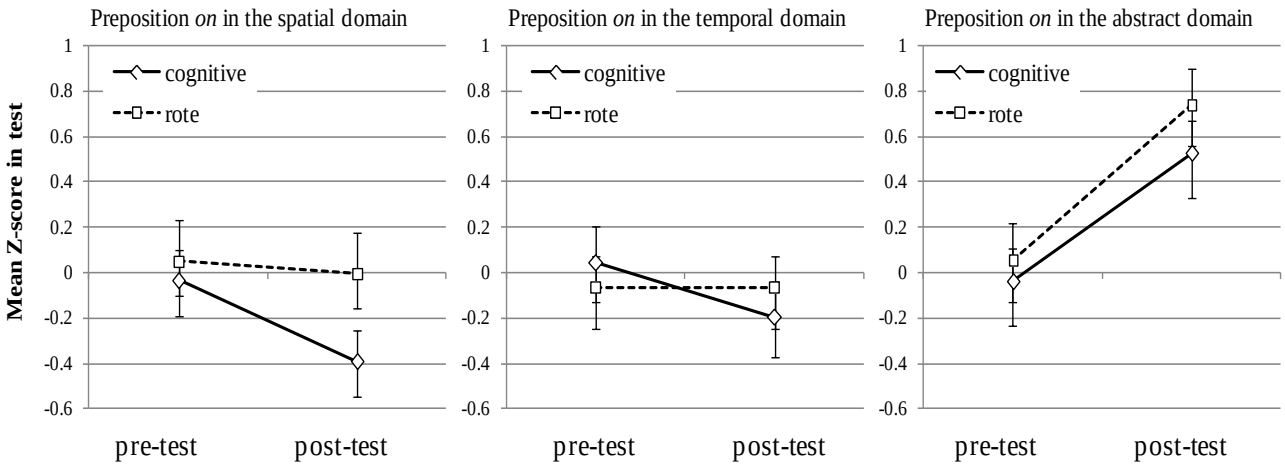


Figure 28. Graph of the mean standardized scores of *on* items across three domains in the pre-test and the post-test for the experimental and the control group (z-scores)

In the one-factor ANCOVA, a significant effect of *group* of the post-test with different prepositions (with the pre-test as co-variate) was uncovered with $F(1, 83)=2.87$, $p=.05$, $\eta^2=.03$ within the spatial domain, a non-significant effect of *group* was shown with $F(1, 83)=.27$, $p=.30$, $\eta^2=.00$ within the temporal domain, and a non-significant effect of *group* was found with $F(1, 83)=.71$, $p=.20$, $\eta^2=.01$ within the abstract domain. In other words, the experimental group did not outperform the control group significantly in the spatial, the temporal and the abstract domain. Moreover, in the spatial domain, the control group performed significantly better than the experimental group.

Items of *at* in the three domains

Table 18a provides the means and standard deviations of the scores of *at* within the three domains in the pre-test and the post-test for the experimental group and the control group (raw data). Table 18b shows the corresponding means and standard deviations of the standardized values (z-scores). The means of the standardized scores are also shown graphically in Figure 29.

Table 18a

Means and standard deviations of the scores of at within the three domains in the pre-test and the post-test for the experimental and the control group (raw data) within the medium track

Dependent variables	**Medium track (*N*=85)**			
as detailed items of *at*	Experimental group (*n*=50)		Control group (*n*=35)	
	M	SD	M	SD
***At* spatial**				
Pre-test	1.12	.96	1.54	1.31
Post-test	1.48	1.03	1.54	1.24
***At* temporal**				
Pre-test	2.02	.97	2.26	.98
Post-test	1.72	1.28	1.91	.98
***At* abstract**				
Pre-test	1.52	1.00	1.34	.97
Post-test	1.56	1.03	1.31	1.11

Table 18b

Means and standard deviations of standardized scores of at within the three domains in the pre-test and the post-test for the experimental and the control group (z-scores) within the medium track

Dependent variables	**Medium track (*N*=85)**			
as detailed items of *at*	Experimental group (*n*=50)		Control group (*n*=35)	
	M	SD	M	SD
***At* spatial**				
Pre-test	-.15	.85	.22	1.16
Post-test	.22	.93	.42	1.07
***At* temporal**				
Pre-test	-.11	.95	.15	1.07
Post-test	-.74	1.10	-.22	1.30
***At* abstract**				
Pre-test	.07	1.01	-1.1	.99
Post-test	.12	1.05	-.14	1.13

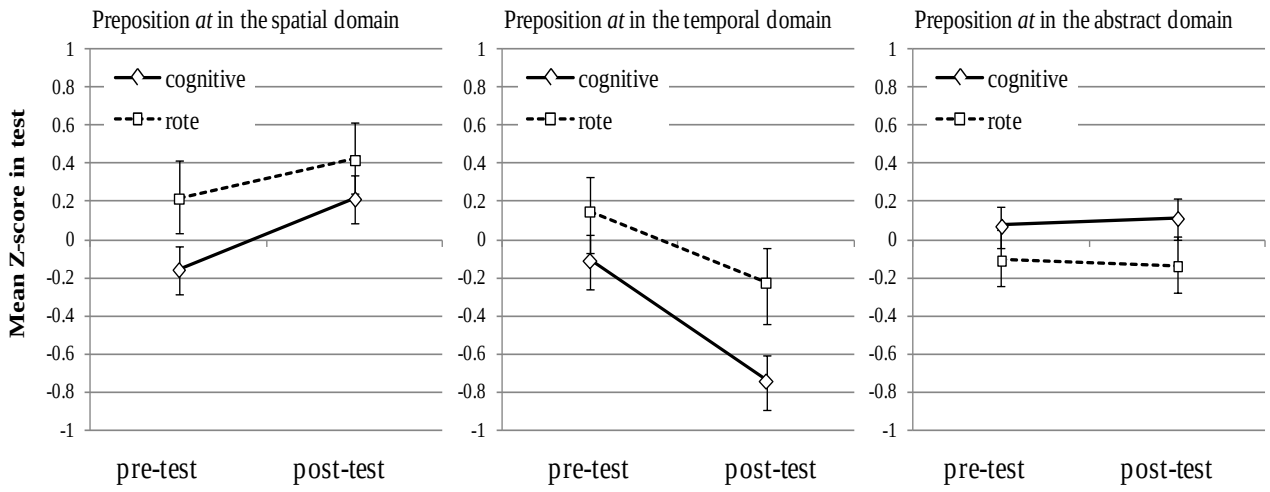


Figure 29. Graph of the mean standardized scores of *at* items within the three domains in the pre-test and the post-test for the experimental and the control group (z-scores)

Based on the effect of *group* of the post-test with *at* items within the three domains (with the pre-test as co-variate) computed by one-factor ANCOVA, a non-significant effect was found in the spatial domain *(*$F(1, 83)=1.09$, $p=.15$, $\eta^2=.01$) , a significant effect was found in the temporal domain ($F(1, 83)=3.60$, $p=.03$, $\eta^2=.04$) and a non-significant effect was found in the abstract domain ($F(1, 83)=.77$, $p=.19$, $\eta^2=.01$). When controlled for the pre-test scores, the experimental group did not perform significantly better than the control group in the post-test regarding to *at* items within the spatial, the temporal and the abstract domain. However, in the temporal domain, the control group performed significantly better than the experimental group.

In the spatial domain, the 2 (× 2)-factor ANOVA yielded a significant effect of *group* ($F(1, 83)=3.80$, $p=.03$, $\eta^2=.04$), a significant effect of *learning* ($F(1, 83)=3.21$, $p=.04$, $\eta^2=.04$) and a non-significant interaction *learning* × *group* ($F(1, 83)=.28$, $p=.15$, $\eta^2=.00$). In the temporal domain, the main effect of *group* showed a highly significant effect ($F(1, 83)=4.93$, $p=.015$, $\eta^2=.06$), the effect of *learning* displayed a high significance ($F(1, 83)=8.99$, $p=.002$,

η^2=.10), and a non-significant interaction *learning* × *group* was found (F(1, 83)=.59, p=.22, η^2=.01). In the abstract domain, the 2 (× 2)-factor ANOVA revealed a non-significant effect of *group* ((1, 83)=1.43, p=.12, η^2=.02), a non-significant effect of *learning* ((1, 83)=.00, p=.48, η^2=.00) and a non-significant effect of interaction *learning* × *group* (F(1, 83)=.06, p=.40, η^2=.00). Accordingly, the experimental group did not perform significantly better than the control group referring to the spatial, the temporal and the abstract domain.

4.1.2.5 Summary

Based on the two hypotheses, the comparisons between the experimental and the control group are shown in Table 19. If a hypothesis was supported, the matched answer is “Yes” marked at different significant levels. Otherwise, if the hypothesis was not supported, the answer is “No”.

Table 19

The significance of achievements of experimental group in the post-test (the medium track)

	Spatial domain	Temporal domain	Abstract domain	**Prepositions across the three domains**
In	Yes	No	No	**Yes**
On	No**	No	No	**No****
At	No	No**	Yes	**No***
Domains referring to three prepositions	**No****	**No***	**Yes**	**Overall items: No***

*p<.10, one-tailed. **p<.05, one-tailed. ***p<.01, one-tailed. ****p<.001, one-tailed.

Generally speaking, *H1* was not supported. For all items, the experimental group did not show significant superiority whereas the control group performed marginally significantly better than the experimental group. Focusing on the three domains, the experimental group did not display a significantly better performance than the control group within all the three domains. The control group displayed a significantly better performance than the experimental group in the spatial domain and a marginally significantly better in the temporal domain, whereas the experimental group's performance in the abstract domain was not significantly better than the control group's. Focusing on the achievements of the three prepositions, the experimental group performed better than the control group on the *in* items but it was not significant. Nevertheless, the control group displayed significantly better achievements than the experimental group on the *on* items and marginally significantly better achievements on the *at* items. Summarizing the results of the three prepositions across the three domains, the experimental group did not a display significantly better performance than the control group with the *in* items across all the three domains as well as the *on* and *at* items across all the three domains. And the control group's achievements of *on* items within the spatial domain and of *at* items within the temporal domain were significantly better than the experimental group.

Briefly, the experimental group did not perform better in the post-test than the control group. The experimental group displayed better achievements than the control group only referring the items in the abstract domain, the *in* items, the *in* items within the spatial domain, the *at* items within the abstract domain. However, focusing on these items, no significant effect was found. The control group tended to display better achievements than the experimental group in the post-test.

4.1.3 Comparison between the higher track and the medium track

Based on the data collected above, this section will compare the achievements in the pre-test and the post-test test between the higher track and the medium track to explore whether CL-inspired meaningful learning approach exerts the same degree of impact on the learners at different proficiency levels. One-factor ANCOVAs were computed with *track (the higher track/the medium track)* and with *group (experimental/control)* as between factors, the post-test score as dependent variable and the pre-test score as control variable and with a special focus on the interaction of *track* × *group.* The results of the comparison will be reported first in the following in the order of (1) analysis of all items: total, (2) analysis of the items within the different domains (spatial, temporal, abstract), and (3) analysis of the items with the three prepositions (*in*, *on*, *at*).

4.1.3.1 All items: total scores

With respect to the all items focusing on total scores, the *H1* was supported by the results within the higher track that the experimental group performed better in the post-test than the control group at a significant level. However, for the medium track, the experimental group did not show significant superiority whereas the control group performed marginally significantly better than the experimental group. In other words, learners at different proficiency levels profited differently from the two learning approaches. The higher track, having students at a higher proficiency level, profited more from the CL-inspired meaningful learning approach than from the traditional rote learning approach. On the contrary, the medium track, having students at a lower proficiency level, profited more from the traditional rote learning approach than from the CL-inspired meaningful learning approach.

The one-factor ANCOVAs of the post-test (with the pre-test as co-variate) revealed a non-significant effect of *track* on the post-test scores ($F(1, 213)=2.65$, $p=.105$, $\eta^2=.01$), a non-

significant effect of *group* on the post-test scores ($F(1, 213)=.00$, $p=.95$, $\eta^2=.00$) and a significant interaction of *track* × *group* ($F(1, 213)=6.03$, $p=.015$, $\eta^2=.03$) (see Figure 30).

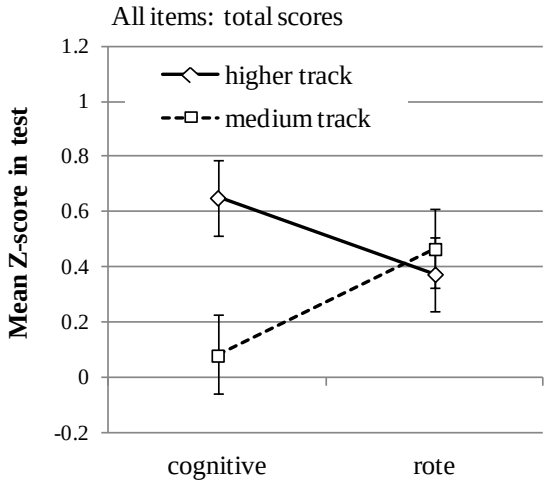


Figure 30. Graph of the mean standardized scores of the achievements of all items the experimental and the control group within the two tracks (z-scores)

The significant interaction indicated that different effects of training (the CL-inspired meaningful learning approach and the traditional rote learning approach) have significantly different influences on different tracks (the higher track and the medium track).The participants at different proficiency levels profited differently from the CL-inspired meaningful learning approach; the higher track profited more from the CL-inspired meaningful learning approach than the medium track. Generally, applying the CL-inspired meaningful learning approach was an advantage for the higher track whereas it became a disadvantage for the medium track.

4.1.3.2 Items within the three domains (spatial, temporal, abstract)

With respect to the items within the three domains, the *H1* was supported by the results within the higher track that the experimental group performed better in the post-test than the control group. In the temporal and the abstract domain, the experimental group performed

better in the post-test than the control group at a significant level. In the spatial domain, even though the experimental group also performed better in the post-test than the control group but it was not at a significant level. However, for the medium track, the experimental group did not show significant superiority and the control group performed marginally significantly better than the experimental group in the spatial and the temporal domain. In the abstract domain, the achievements of the experimental group was better than the control group but with no significant effect. In other words, learners at different proficiency levels profited differently from the two learning approaches in the spatial and the temporal domain. In the abstract domain, two tracks displayed the similar tendency that the experimental group performed better than the control group. However, the achievements within the medium track were not significant. In short, the higher track, having students at a higher proficiency level, profited more from the CL-inspired meaningful learning approach within all the three domains. On the contrary, the medium track only profited more from the CL-inspired meaningful learning approach within the abstract domain. The one-factor ANCOVAs were also computed for the items within the three domains (see Figure 31).

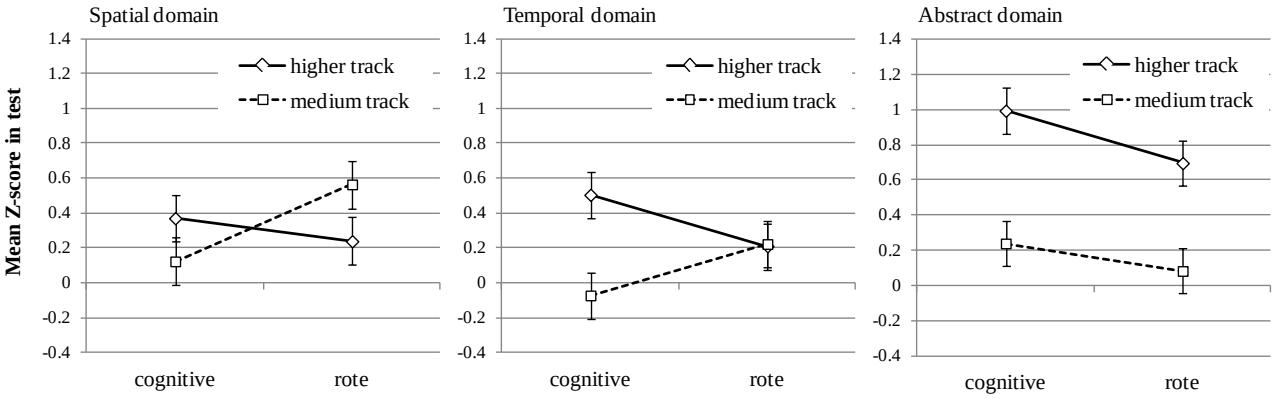


Figure 31. Graph of the mean standardized scores of the achievements of all items the experimental and the control group within the two tracks (z-scores)

In the spatial domain, the one-factor ANCOVAs revealed a non-significant effect of *track* on the post-test scores ($F(1, 213)=.10$, $p=.76$, $\eta^2=.00$), a non-significant effect of *group* on the post-test scores ($F(1, 213)=.44$, $p=.51$, $\eta^2=.00$) and a significant interaction of *track* × *group* ($F(1, 213)=.4.66$, $p=.032$, $\eta^2=.02$). It indicated that applying the CL-inspired meaningful learning approach and the traditional rote learning approach had different effects on different tracks.

In the temporal domain, the one-factor ANCOVAs revealed a significant effect of *track* on the post-test scores ($F(1, 213)=4.02$, $p=.046$, $\eta^2=.02$), a non-significant effect of *group* on the post-test scores ($F(1, 213)=.00$, $p=.99$, $\eta^2=.00$) and a significant interaction ($F(1, 213)=4.48$, $p=.035$, $\eta^2=.02$). It indicated that participants at different proficiency levels profited differently by applying the CL-inspired meaningful learning approach that the higher track profited more from this approach than the medium track.

In the abstract domain, the one-factor ANCOVAs revealed a very highly significant effect of *track* on the post-test scores ($F(1, 213)=25.45$, $p<.001$, $\eta^2=.10$), a marginally significant effect of *group* on the post-test scores ($F(1, 213)=2.86$, $p=.092$, $\eta^2=.01$) and a non-significant interaction of *track* × *group* ($F(1, 213)=.28$, $p=.60$, $\eta^2=.00$). The participants at different proficiency levels within the higher track and the medium track profited similarly by the CL-inspired meaningful learning approach and by the traditional rote learning approach. Both the higher track and the medium track profited more from the CL-inspired meaningful learning approach than the traditional rote learning approach.

To sum up, within the three domains, the advantage of applying the CL-inspired meaningful learning approach within the higher track was significantly displayed in the spatial domain and the temporal domain. By contrast, applying the CL-inspired meaningful learning approach within the medium track in the spatial and the temporal domain displayed

disadvantage. In the abstract domain, the positive effects of applying the CL-inspired meaningful learning approach were shown within the higher and the medium track.

Moreover, from another aspect to explore the achievements of participants within the higher track and the medium track, the differences among the three domains were considered. The data of the four groups including the experimental group in higher track, the control group in higher track, the experimental group in medium track and the control group in medium track displayed the same tendency that participants all performed the best on the items within the spatial domain, then performed medium on the items within the temporal domain and performed the worst on the items within the abstract domain. In addition, the one-factor ANCOVAs were computed with *domain (spatial/temporal/abstract)* as a between factor, the post-test scores as dependent variable and the pre-test scores as control variable. Within the higher track, the effect of *domain* was significant for the experimental group ($F(1, 78)=4.56$, $p=.006$, $\eta^2=.06$) and for the control group ($F(1, 51)=5.19$, $p=.004$, $\eta^2=.09$). However, within the medium track, the effect of *domain* was not significant for the experimental group ($F(1, 48)=1.06$, $p=.17$, $\eta^2=.02$) and for the control group ($F(1, 33)=.84$, $p=.22$, $\eta^2=.02$).

In short, the achievements of the domains in the pre-test and the post-test test between the higher track and the medium track firstly demonstrated that the experimental group using CL-inspire approach for meaningful teaching would perform better in the post-test than the control group using traditional approach for rote teaching within the higher track (significantly better achievements were found in the temporal and the abstract domain) whereas within the medium track the *H1* was supported by the achievements in the abstract domain but it was not at a significant level. The effect of *interaction* was significant in the spatial domain and the temporal domain whereas was not significant in the abstract domain. Focusing on different tracks, different learning approaches had significant different effects on

the achievements in the spatial domain and the temporal domain. In other words, the effects of applying the CL-inspired meaningful learning approach were different in the higher track from the medium track in the spatial domain and the temporal domain. Focusing on the items in the abstract domain, the higher and the medium track all profited more from the CL-inspired meaningful learning approach than the traditional rote learning approach. Moreover, within the higher track, the differences among the three domains were highly significant for both the experimental and the control group. On the contrary, within the medium track, the differences among three domains were not significant for both the experimental and the control group.

4.1.3.3 Items with the three prepositions (*in, on, at*)

With respect to the items with the three prepositions, the *H1* was supported by the results within the higher track that the experimental group performed better in the post-test than the control group on the three prepositions but only the *in* items revealed a highly significant effect of applying the CL-inspired meaningful learning approach. However, within the medium track, the experimental group only performed better than the control group on the *in* items but with no significant effect.

The results of one-factor ANCOVAs for the three prepositions are illustrated in the Figure 32.

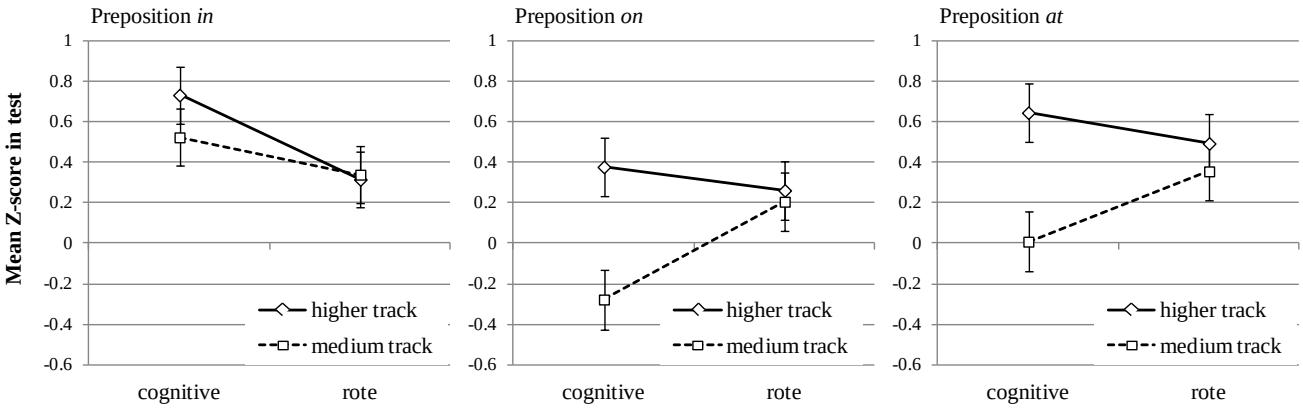


Figure 32. Graph of the mean standardized scores of the achievements of all items the experimental and the control group within the two tracks (z-scores)

Referring to the *in* items, the one-factor ANCOVAs revealed a non-significant effect of *track* on the post-test scores ($F(1, 213)=.30$, $p=.59$, $\eta^2=.00$), a significant effect of *group* on the post-test scores ($F(1, 213)=5.69$, $p=.018$, $\eta^2=.03$) and a non-significant interaction of *track* × *group* ($F(1, 213)=1.38$, $p=.24$, $\eta^2=.01$). For the participants at different proficiency levels, the CL-inspired meaningful learning approach and the traditional rote learning approach had no different effects on the higher track and the medium track.

Referring to the *on* items, the one-factor ANCOVAs revealed a significant effect of *track* ($F(1, 213)=5.25$, $p=.023$, $\eta^2=.02$), a non-significant effect of *group*($F(1, 213)=1.43$, $p=.23$, $\eta^2=.01$) and a marginally significant interaction of *track* × *group* ($F(1, 213)=3.69$, $p=.056$, $\eta^2=.02$). Applying the CL-inspired meaningful learning approach and the traditional rote learning approach had significantly different effects on the higher track and the medium track that the higher track profited more from the CL-inspired meaningful learning approach whereas the medium track profited more from the traditional rote learning approach.

Referring to the *at* items, the one-factor ANCOVAs revealed a very highly significant effect of *track* on the post-test scores ($F(1, 213)=8.03$, $p=.005$, $\eta^2=.04$), a non-significant effect of *group* on the post-test scores ($F(1, 213)=.27$, $p=.60$, $\eta^2=.00$) and a marginally

significant interaction ($F(1, 213)=3.35$, $p=.069$, $\eta^2=.02$). Similarly as the achievement for *on* items, applying different teaching and learning approaches of *at* items had different effects on different tracks.

From another aspect, the differences among the three prepositions within the two tracks were taken into account. The one-factor ANCOVAs were computed with *preposition (in/on/at)* as a between factor, the post-test scores as dependent variable and the pre-test scores as control variable. In other words, within the higher track, the effects of *preposition* were highly significant for the experimental group ($F(1, 78)=4.96$, $p=.004$, $\eta^2=.06$) and for the control group ($F(1, 51)=5.43$, $p=.003$, $\eta^2=.10$). Within the medium track, the effects of *preposition* were not significant for the experimental group ($F(1, 48)=.78$, $p=.23$, $\eta^2=.02$) and for the control group ($F(1, 33)=.13$, $p=.44$, $\eta^2=.00$). In other words, the effect of *preposition* was highly significant for the higher track but not for the medium track. Within the experimental group, the same tendency was displayed that participants within the two tracks performed the best on the *in* items, performed medium on the *at* items and performed the worst on the *on* items. Focusing on the achievements of the control group, the participants within the two tracks performed the best on the *at* items, performed medium on the *in* items and performed the worst on the *on* items. Generally, the achievements of the three prepositions displayed the similar tendency that participants all performed the worst on the items referring to *on* but the experimental group and the control group had different performance on the *in* and *at* items.

To sum up, the achievements of three prepositions in the pre-test and the post-test test between the higher track and the medium track firstly demonstrated that the experimental group using the CL-inspired approach for meaningful teaching would perform better in the post-test than the control group using traditional approach for rote teaching within the higher track (highly significantly better achievements were found in the items referring to *in*)

whereas within the medium track *H1* was supported by the achievements of the items referring to *in* but not at a significant level. The effect of interaction was not significant for the items referring to *in*, was marginally significant for the items referring to *on* and was marginally significant for the items referring to *at*. The positive effects of applying the CL-inspired meaningful learning approach for the three prepositions were stronger in the higher track than in the medium track. The effects of applying the CL-inspired meaningful learning approach for the three prepositions in the higher track is only positive for *in* items but negative for *on* and *at* items. It indicated that the medium track didn't profit from the CL-inspired meaningful learning approach and applying the CL-inspired meaningful learning approach seemed harmful to them. Moreover, the participants within the two tracks all had the lowest achievements of *on* items. Within the higher track, participants of the experimental and the control group displayed significant differences among the three prepositions and they performed the best on *in* items, medium on *at* items and the worst on *on* items. Within the medium track, participants displayed non-significant differences among the three prepositions and they performed the best on *at* items, medium on *in* items and also the worst on *on* items.

4.1.3.4 Summary

Generally speaking, the effects of interaction were significant in many cases, including all items, the items in the spatial domain, the items in the temporal domain, the items referring to *on* and the items referring to *at*, which indicated the effects of applying the CL-inspired meaningful learning approach were different within the higher track from within the medium track. The positive effects of applying the CL-inspired meaningful learning approach were stronger within the higher track than within the medium track. The effects of applying the CL-inspired meaningful learning approach within the medium track were negative that the medium track didn't profit from applying the CL-inspired meaningful learning approach.

Nevertheless, that the CL-inspired meaningful learning approach exerts the same influence on the achievements of learners at different proficiency levels was supported by the results in the abstract domain and the items referring to *in* that both the higher track and the medium track profited from applying the CL-inspired meaningful learning approach, even if the degree of the influence was different.

In addition, focusing on the achievements in the three domains, the higher track and the medium track always performed the best achievements in the spatial domain, the medium in the temporal domain and the worst in the abstract domain. The participants within the higher track can be aware of the differences among the three domains and the effects of *domain* were significant. By contrast, the effects of *domain* were not significant for the medium track. Focusing on the achievements of the three prepositions, the higher track and the medium track generally performed the worst on the items of *o*n. Participants within the higher track performed the best for *in* items, the medium for *at* items and significant effects of *prepositions* were found. Differently, within the medium track, the participants performed the best for *at* items, the medium for *in* items and no significant effect of *preposition* was found.

4.2 Results of Hypothesis 2 Focusing on the Improvements from the Pre-test to the Post-test

In order to test the *H2* that the experimental group improved more than the control group from the pre-test to the post-test, 2 (× 2)-ANOVAs were computed with the between-factor *group (experimental/control)* and the within-factor *learning (pre-test/post-test)* with a special focus on the interaction *group* × *learning*.

4.2.1 Results of the higher track

The results of the higher track will be reported first in the following in the order of (1) analysis of all items: total, (2) analysis of the items within the different domains (spatial,

temporal, abstract), (3) analysis of the items with the three prepositions (*in*, *on*, *at*), and (4) analysis of the items of the three prepositions *in*, *on*, *at* across the spatial, the temporal and the abstract domain.

4.2.1.1 All items: total scores

The 2 (× 2)-factor ANOVA showed a non-significant effect of *group* ($F(1,131)= .01$, $p=.46$, $\eta^2=.00$), a very highly significant effect of *learning* ($F(1, 131)=20.36$, $p<.001$, $\eta^2=.14$) and a highly significant interaction of *learning* × *group* ($F(1, 131)=7.52$, $p=.004$, $\eta^2=.05$). Accordingly, the experimental group improved highly significantly more than the control group (see Figure 21).

4.2.1.2 Items within the three domains (spatial, temporal, abstract)

In the spatial domain, the 2 (× 2)-factor ANOVA yielded a non-significant effect of *group* ($F(1, 131)=1.17$, $p=.14$, $\eta^2=.01$), a significant effect of *learning* ($F(1, 131)=5.20$, $p=.012$, $\eta^2=.04$) and a highly significant interaction of *learning* × *group* ($F(1, 131)=6.05$, $p=.008$, $\eta^2=.04$). In the temporal domain, the main effect of *group* showed a non-significant effect *(*$F(1, 131)=.57$, $p=.23$, $\eta^2=.00$), the effect of *learning* displayed a highly significance ($F(1, 131)=8.99$, $p=.0015$, $\eta^2=.06$), and a significant interaction of *learning* × *group* was found ($F(1, 131)=2.81$, $p=.049$, $\eta^2=.02$). In the abstract domain, the 2 (× 2)-factor ANOVA revealed a non-significant effect of *group* ($F(1, 131)=1.05$, $p=.15$, $\eta^2=.01$), a very highly significant effect of *learning* ($F(1, 131)=60.40$, $p<.001$, $\eta^2=.32$) and a marginally significant of interaction of *learning* × *group* ($F(1, 131)=2.13$, $p=.07$, $\eta^2=.02$). As a consequence, the experimental group improved highly significantly more than the control group in the spatial domain, slightly significant more in the temporal domain and marginally significant more than in the abstract domain (see Figure 22).

4.2.1.3 Items with the three prepositions (*in, on, at*)

The 2 (× 2)-factor ANOVA of the scores for the items with *in* showed a non-significant effect of *group* ($F(1, 131)=.00$, $p=.49$, $\eta^2=.00$), a very highly significant effect of *learning* ($F(1, 131)=20.62$, $p<.001$, $\eta^2=.14$) and a very highly significant interaction of *learning* × *group* ($F(1, 131)=15.18$, $p<.001$, $\eta^2=.10$). Focusing on the scores of the *on* items, a non-significant effect of *group* ($F(1, 131)=.51$, $p=.24$, $\eta^2=.00$), a highly significant effect of *learning* ($F(1, 131)=7.32$, $p=.004$, $\eta^2=.05$) and a non-significant interaction of *learning* × *group* ($F(1, 131)=0.2$, $p=.44$, $\eta^2=.00$) were shown by the 2 (× 2)-factor ANOVA. Focusing on the scores of the items with *at*, a non-significant effect of *group* ($F(1, 131)=.02$, $p=.45$, $\eta^2=.00$), a very highly significant effect of *learning* ($F(1, 131)=21.11$, $p<.001$, $\eta^2=.14$) and a marginally significant interaction of *learning* × *group* ($F(1, 131)=1.95$, $p=.08$, $\eta^2=.02$) were shown by the 2 (× 2)-factor ANOVA. Accordingly, the experimental group improved significantly more than the control group with the *in* items, but not with the *on* items and only marginally significantly more than the control group with the *at* items (see Figure 23).

4.2.1.4 Items of the three prepositions (*in, on, at*) across three domains

In order to explore the deep relationship among English prepositions and different domains, more detailed data from the experimental group and the control group are reported.

Items of *in* in the three domains

In the spatial domain, the 2 (× 2)-factor ANOVA of the scores for the items with *in* showed a non-significant effect of *group* ($F(1, 131)=.23$, $p=.44$, $\eta^2=.00$), a non-significant effect of *learning* ($F(1, 131)=1.54$, $p=.11$, $\eta^2=.01$) and a significant interaction of *learning* × *group* ($F(1, 131)=5.34$, $p=.011$, $\eta^2=.04$). Focusing on the scores of the *in* items within the temporal domain, a non-significant effect of *group* ($F(1, 131)=.01$, $p=.46$, $\eta^2=.00$), a very highly significant effect of *learning* ($F(1, 131)=11.04$, $p=.0005$, $\eta^2=.08$) and a highly

significant interaction of *learning* × *group* ($F(1, 131)=5.75$, $p=.009$, $\eta^2=.04$) were shown by the 2 (× 2)-factor ANOVA. Focusing on the scores of the *in* items within the abstract domain, a non-significant effect of *group* ($F(1, 131)=.05$, $p=.41$, $\eta^2=.00$), a very high significant effect of *learning* ($F(1, 131)=10.96$, $p=.0005$, $\eta^2=.08$) and a significant interaction of *learning* × *group* ($F(1, 131)=3.82$, $p=.027$, $\eta^2=.03$) were shown by the 2 (×2)-factor ANOVA. Therefore, the experimental group within the higher track improved highly significantly better than the control group referring to the spatial domain, the temporal domain and the abstract domain (see Figure 24).

Items of *on* in the three domains

In the 2 (× 2)-factor ANOVA, the scores for the items with *on* within the spatial domain revealed a marginally significant effect of *group* ($F(1, 131)=2.56$, $p=.06$, $\eta^2=.02$), a non-significant effect of *learning* ($F(1, 131)=.18$, $p=.34$, $\eta^2=.00$) and a non-significant interaction of *learning* × *group* ($F(1, 131)=.37$, $p=.28$, $\eta^2=.00$). In the temporal domain, the 2 (× 2)-factor ANOVA showed a marginally significant effect of *group* ($F(1, 131)=2.46$, $p=.06$, $\eta^2=.02$), a highly significant effect of *learning* ($F(1, 131)=7.51$, $p=.0035$, $\eta^2=.05$) and a non-significant interaction of *learning* × *group* ($F(1, 131)=.18$, $p=.34$, $\eta^2=.00$). In the abstract domain, a marginally significant effect of *group* ($F(1, 131)=1.90$, $p=.09$, $\eta^2=.01$), a very highly significant effect of *learning* ($F(1, 131)=3.38$, $p=.034$, $\eta^2=.03$) and a non-significant interaction of *learning* × *group* ($F(1, 131)=.02$, $p=.45$, $\eta^2=.00$) were shown by the 2 (× 2)-factor ANOVA. Accordingly, the experimental group did not improve significantly more than the control group referring to the spatial, the temporal and the abstract domain (see Figure 25).

Items of *at* within the three domains

In the spatial domain, the 2 (× 2)-factor ANOVA yielded a non-significant effect of *group* ($F(1, 131)=.55$, $p=.23$, $\eta^2=.00$), a significant effect of *learning* ($F(1, 131)=4.94$, $p=.014$,

η^2=.04) and a marginally significant interaction of *learning* × *group* (F(1, 131)=1.83, p=.09, η^2=.01). In the temporal domain, the main effect of *group* showed a non-significant effect (F(1, 131)=.02, p=.44, η^2=.00). The effect of *learning* displayed a non-significance (F(1, 131)=.50, p=.24, η^2=.00), and the interaction of *learning* × *group* (F(1, 131)=1.13, p=.15, η^2=.01) was also found to be not significant. In the abstract domain, the 2 (× 2)-factor ANOVA revealed a non-significant effect of *group* (F(1, 131)=.76, p=.19, η^2=.01), a very highly significant effect of *learning* (F(1, 131)=59.90, p<.001, η^2=.31) and a non-significant of interaction of *learning* × *group* (F(1, 131)=.13, p=.36, η^2=.00). Accordingly, the experimental group improved minimally significantly more than the control group referring to the spatial domain, but not significantly better than the control group in the temporal and the abstract domain (see Figure 23).

4.2.1.5 Summary

In Table 20, the comparisons between the experimental and the control group are summarized from the perspective of the two hypotheses that the experimental group would improve more from the pre-test to the post-test (*H2*). If a hypothesis was supported, the matched answer is “Yes” marked at different significant levels. Otherwise, if the hypothesis was not supported, the answer is “No”.

Table 20

The significance of improvements of experimental group in the post-test (the higher track)

	Spatial domain	Temporal domain	Abstract domain	**Prepositions across the three domains**
In	Yes**	Yes***	Yes**	**Yes****
On	Yes	No	Yes	**Yes**
At	Yes*	Yes	Yes	**Yes***
Domains referring to three prepositions	**Yes*****	**Yes****	**Yes***	**Overall items:** Yes***

*p<.10, one-tailed. **p<.05, one-tailed. ***p<.01, one-tailed. ****p<.001, one-tailed.

Generally speaking, the hypothesis (*H2*) that the experimental group improved more than the control group from the pre-test to the post-test were found in every variable expect for the *on* items within the temporal domain. For all items (total scores), the experimental group improved highly significant more than the control group. In each of the three domains, the experimental group outperformed the control group. Compared with the temporal and the abstract domain, the improvements of the experimental group in the spatial domain were the most significantly more than the control group. Next in order, the improvements of the experimental group in the temporal domain were significantly more than the control group. The improvements of the experimental group in the abstract were marginal significantly more than the control group. While the experimental group improved dramatically, the improvements of the control group were relative: it decreased mildly in the spatial domain

and improved gradually in the temporal and the abstract domain. The experimental group also improved more than the control group on the three prepositions. Compared with *on* and *at*, the improvements of *in* items was the most significant. In other words, the improvements of the experimental group of *in* items were very high significant more than the control group. The improvements of *on* items in the experimental group did not significantly differ from the control group. The improvements of the experimental group focusing on *at* items only displayed a marginal significant more than the control group in the spatial domain. Summarizing the results of the three prepositions across the three domains, the experimental group displayed significantly more improvements than the control group with the *in* items across all three domains, and the experimental group's improvements with the *at* items were marginally significantly more than the control group in the spatial domain but they were not significant more than the control group in the temporal and the abstract domain. Improvements with the *on* items revealed mixed (two positive and one negative) results and all the results were not at significant level.

In short, regarding the improvements, the significances mostly originated from all items, items in the three domains, items of *in* (in the spatial, the temporal and the abstract domain) and *at* (in the spatial domain).

4.2.2 Results of the medium track

The same analysis measures were also implemented in the medium track. The 2 (× 2)-ANOVAs were computed with the between-factor *group (experimental/control)* and the within-factor *learning (pre-test/post-test)* with a special focus on the interaction of *group* × *learning* in order to test the hypothesis that the experimental group improved more than the control group from the pre-test to the post-test. The data will be reported in the following order: (1) analysis of all items: total, (2) analysis of the items within the different domains

(spatial, temporal, abstract), (3) analysis of the items with the three prepositions (*in*, *on*, *at*), and (4) analysis of the items of the three prepositions *in*, *on*, *at* across the spatial, the temporal and the abstract domain.

4.2.2.1 All items: total scores

The 2 (× 2)-factor ANOVA showed a marginally significant effect of *group* ($F(1, 83)= 2.28$, $p=.07$, $\eta^2=.03$), a significant effect of *learning* ($F(1, 83)=3.28$, $p=.04$, $\eta^2=.04$) and a non-significant interaction of *learning* × *group* ($F(1, 83)=.70$, $p=.20$, $\eta^2=.01$). Accordingly, the experimental group did not improve significantly more than the control group and the improvements in the experimental group were less than that in the control group (see Figure 27).

4.2.2.2 Items within the three domains (spatial, temporal, abstract)

In the spatial domain, the 2 (× 2)-factor ANOVA yielded a significant effect of *group* ($F(1, 83)=3.10$, $p=.04$, $\eta^2=.04$), a significant effect of *learning* ($F(1, 83)=5.25$, $p=.012$, $\eta^2=.06$) and a non-significant interaction of *learning* × *group* ($F(1, 83)=.91$, $p=.17$, $\eta^2=.01$). In the temporal domain, the main effects of *group* showed a non-significant effect *(*$F(1, 83)=.94$, $p=.17$, $\eta^2=.01$), the effects of *learning* displayed a non-significance ($F(1, 83)=.22$, $p=.32$, $\eta^2=.00$), and a non-significant interaction *learning* × *group* was found ($F(1, 83)=.85$, $p=.18$, $\eta^2=.01$). In the abstract domain, the 2 (× 2)-factor ANOVA revealed a non-significant effect of *group* ($F(1, 83)=.22$, $p=.32$, $\eta^2=.00$), a non-significant effect of *learning* ($F(1, 83)=1.14$, $p=.14$, $\eta^2=.01$) and a non-significant of interaction of *learning* × *group* ($F(1, 83)=.30$, $p=.29$, $\eta^2=.00$). As a consequence, the experimental group did not improve significantly more than the control group in the spatial, the temporal and the abstract domain. Even if there was a non-significant effect of *group* in the abstract domain, the experimental group improved more than the control group (see Figure 28).

4.2.2.3 Items with the three prepositions (*in, on, at*)

The 2 (× 2)-factor ANOVA of the scores for the items *in* showed a non-significant effect of *group* ($F(1, 83)=.28$, $p=.30$, $\eta^2=.00$), a very highly significant effect of *learning* ($F(1, 83)=8.20$, $p=.003$, $\eta^2=.09$) and a non-significant interaction of *learning* × *group* ($F(1, 83)=.32$, $p=.29$, $\eta^2=.00$). Focusing on the scores of the items *on*, a marginally significant effect of *group* ($F(1, 83)=2.20$, $p=.07$, $\eta^2=.03$), a non-significant effect of *learning* ($F(1, 83)=.04$, $p=.42$, $\eta^2=.00$) and a marginally significant interaction of *learning* × *group* ($F(1, 83)=1.92$, $p=.09$, $\eta^2=.02$) were shown by the 2 (× 2)-factor ANOVA. Focusing on the scores of the items with *at*, a marginally significant effect of *group* ($F(1, 83)=2.27$, $p=.07$, $\eta^2=.03$), a non-significant effect of *learning* ($F(1, 83)=1.63$, $p=.10$, $\eta^2=.02$) and a non-significant interaction of *learning* × *group* ($F(1, 83)=41$, $p=.26$, $\eta^2=.01$) were shown by the 2 (× 2)-factor ANOVA. Accordingly, the experimental group did not improve more than the control group on the items of *in, on and at*. The experimental group improved more than the control group regarding *in* items, but not significantly. The control group improved significantly more than the experimental group referring to the *on* items, but not significantly more than the experimental group referring to the *at* items (see Figure 26).

4.2.2.4 Items of the three prepositions (*in, on, at*) across three domains

In order to explore the deep relationship among English prepositions and different domains, more detailed data from the experimental group and the control group are reported.

Items of *in* in the three domains

In the 2 (× 2)-factor ANOVA, the scores for the items with *on* within the spatial domain revealed a non-significant effect of *group* ($F(1, 83)=.36$, $p=.28$, $\eta^2=.00$), a highly significant effect of *learning* ($F(1, 83)=7.45$, $p=.004$, $\eta^2=.08$) and a non-significant interaction of *learning* × *group* ($F(1, 83)=.00$, $p=.47$, $\eta^2=.00$). In the temporal domain, the 2 (× 2)-factor

ANOVA showed a non-significant effect of *group* ($F(1, 83)=.13$, $p=.36$, $\eta^2=.00$), a significant effect of *learning* ($F(1, 83)=3.79$, $p=.03$, $\eta^2=.04$) and a non-significant interaction of *learning* × *group* ($F(1, 83)=.01$, $p=.47$, $\eta^2=.00$). In the abstract domain, a non-significant effect of *group* ($F(1, 83)=.59$, $p=.23$, $\eta^2=.01$), a significant effect of *learning* ($F(1, 83)=3.90$, $p=.03$, $\eta^2=.05$) and a non-significant interaction of *learning* × *group* ($F(1, 83)=.20$, $p=.33$, $\eta^2=.00$) were shown by the 2 (× 2)-factor ANOVA. Accordingly, the experimental group did not improve significantly more than the control group within the spatial, the temporal and the abstract domain (see Figure 27).

Items of *on* in the three domains

In the 2 (× 2)-factor ANOVA, the scores for the *on* a items within the spatial domain revealed a marginally significant effect of *group* ($F(1, 83)=2.09$, $p=.08$, $\eta^2=.03$), a marginally significant effect of *learning* ($F(1, 83)=1.81$, $p=.09$, $\eta^2=.02$) and a non-significant interaction of *learning* × *group* ($F(1, 83)=.98$, $p=.16$, $\eta^2=.01$). In the temporal domain, the 2 (× 2)-factor ANOVA showed a non-significant effect of *group* ($F(1, 83)=.00$, $p=.48$, $\eta^2=.00$), a non-significant effect of *learning* ($F(1, 83)=.52$, $p=.24$, $\eta^2=.01$) and a non-significant interaction of *learning* × *group* ($F(1, 83)=.52$, $p=.24$, $\eta^2=.01$). In the abstract domain, a non-significant effect of *group* ($F(1, 83)=.89$, $p=.17$, $\eta^2=.01$), a very highly significant effect of *learning* ($F(1, 83)=10.42$, $p=.001$, $\eta^2=.11$) and a non-significant interaction of *learning* × *group* ($F(1, 83)=.09$, $p=.38$, $\eta^2=.00$) were shown by the 2 (× 2)-factor ANOVA. Accordingly, the experimental group did not improve significantly more than the control group referring to the spatial, the temporal and the abstract domain. However, in the spatial domain, the control group improved significantly more than the experimental group (see Figure 28).

Items of *at* in the three domains

In the spatial domain, the 2 (× 2)-factor ANOVA yielded a significant effect of *group* ($F(1, 83)=3.80$, $p=.03$, $\eta^2=.04$), a significant effect of *learning* ($F(1, 83)=3.21$, $p=.04$, $\eta^2=.04$)

and a non-significant interaction of *learning* × *group* ($F(1, 83)=.28$, $p=.15$, $\eta^2=.00$). In the temporal domain, the main effect of *group* showed a highly significant effect ($F(1, 83)=4.93$, $p=.015$, $\eta^2=.06$), the effect of *learning* displayed a high significance ($F(1, 83)=8.99$, $p=.002$, $\eta^2=.10$), and a non-significant interaction of *learning* × *group* was found ($F(1, 83)=.59$, $p=.22$, $\eta^2=.01$). In the abstract domain, the 2 (× 2)-factor ANOVA revealed a non-significant effect of *group* ($F(1, 83)=1.43$, $p=.12$, $\eta^2=.02$), a non-significant effect of *learning* ($F(1, 83)=.00$, $p=.48$, $\eta^2=.00$) and a non-significant of interaction of *learning* × *group* ($F(1, 83)=.06$, $p=.40$, $\eta^2=.00$). Accordingly, the experimental group did not improve significantly more than the control group referring to the spatial, the temporal and the abstract domain (see Figure 29).

4.2.2.5 Summary

In terms of improvement from the pre-test to the post-test (*H2*), the comparisons between the experimental and the control group are shown in Table 21. If a hypothesis was supported, the matched answer is “Yes” marked at different significant levels. Otherwise, if the hypothesis was not supported, the answer is “No”.

Table 21

The significance of improvements of experimental group in the post-test (the medium track)

	Spatial domain	Temporal domain	Abstract domain	**Prepositions across the three domains**
In	Yes	Yes	Yes	**Yes**
On	No	No	**No**	**No***
At	Yes	No	Yes	**No**
Domains referring to three prepositions	**No**	**No**	**Yes**	**Overall items: No**

*p<.10, one-tailed. **p<.05, one-tailed. ***p<.01, one-tailed. ****p<.001, one-tailed.

Generally speaking, the second hypothesis *H2* that the experimental group improved more than the control group from the pre-test to the post-test was not supported by every variable. For all items, the experimental group did not displayed better improvements, and the control group improved more. Within the three domains, the experimental group did not significantly improve more than the control group. In the spatial domain, the experimental and the control group had improvements and the control group improved more than the experimental group. In the temporal domain, the experimental group decreased mildly whereas the control group kept on improving. In the abstract domain, the experimental group improved more than the control group, but it was not significant. Referring to the three prepositions, the improvements of the experimental group were not significantly more than the control group. Regarding the *in* items, there were improvements in both the experimental and the control group. The experimental group improved more than the control group but it

was not significant. Focusing on the *on* items, the decline was not significant in the experimental group whereas the improvement of the control group was more than the experimental group but not significant. Hence, the improvements of the experimental group significantly differed from the control group. With regard to the *at* items, the experimental group and the control group had improvements from the pre-test to the post-test. The control group improved more than the experimental group but it was not significant. Summarizing the results of the three prepositions across the three domains, the experimental group did not display significantly more improvements than the control group. With the *in* items across all the three domains, the experimental group improved more than the control group but revealed no significant interaction. Improvements with the *on* items revealed negative results in the spatial and the temporal domain that the experimental group decreased less in the spatial and the temporal domain and the control group decreased less than the experimental group in the spatial domain and had no improvement in the temporal domain. For the *on* items in the abstract domain, both groups improved and the control group improved more than the experimental group. The experimental group's improvements with the *at* items across the three domains was not significantly more than the control group. The mixed (two negative and one positive) results were displayed and the positive result was that the experimental group improved more than the control group in the abstract domain.

Briefly, the control group had more stable improvements than the experimental group for most cases. The exceptions were the decrease of the *on* items within the spatial domain and the *at* items within the temporal domain. Though, in the experimental group, the improvements were irregular with eleven positive and five negative results. In addition, the experimental group improved more than the control group on the items in the abstract domain, the *in* items, the *in* items across the three domains and the *at* items across the spatial and the

abstract domain. Contrary, the control group improved more than the experimental group, especially there were significantly more improvements referring to the *on* items.

4.2.3 Comparison between the higher track and the medium track

Based on the data collected above, this section will compare the improvements for the pre-test to the post-test test between the higher track and the medium track to explore whether the CL-inspired meaningful learning approach exerts the same degree of impact on the learners at different proficiency levels. 2 × 2 (× 2) ANCOVAs were computed with the within-factor *learning (pre-test/post-test)* and the between factors *track (the higher track/ the medium track)* and *group (experimental/control)* with a special focus on the interaction of *learning* × *track* × *group*. The results of the comparison will be reported first in the following in the order of (1) analysis of all items: total scores, (2) analysis of the items within the different domains (spatial, temporal, abstract), and (3) analysis of the items with the three prepositions (*in*, *on*, *at*).

4.2.3.1 All items: total scores

With respect to the all items focusing on total scores, the *H2* was supported by the results within the higher track that the experimental group improved significantly more in the post-test than the control group. However, for the medium track, the experimental group did not improve significantly whereas the control group improved marginally more than the experimental group. In other words, participants at different proficiency levels improved differently from the two learning approaches. The higher track, having participants at a higher proficiency level, improved more by applying the CL-inspired meaningful learning approach. By contrast, the medium track, having participants at a lower proficiency level, improved more by applying the traditional rote learning approach.

Regarding to all items focusing on total scores within the higher track and the medium track, the 2 × 2 (× 2) ANOVAs showed a very highly significant main effect of *learning* ($F(1, 214)=17.79$, $p<.01$, $\eta^2=.08$), a non-significant main effect of *track* ($F(1, 214)=1.26$, $p=.26$, $\eta^2=.01$), a non-significant main effect of *group* ($F(1, 214)=1.49$, $p=.22$, $\eta^2=.01$), a significant interaction of *learning* × *track* × *group* ($F(1, 214)=5.52$, $p=.92$, $\eta^2=.03$). The significant interaction indicated that from the pre-test to the post-test, the effects of applying the CL-inspired meaningful learning approach had different influence on the different tracks. The higher track improved more by applying the CL-inspired meaningful learning approach than the medium track. By contrast, the medium track improved more by applying the traditional rote learning approach.

4.2.3.2 Items within the three domains (spatial, temporal, abstract)

From the pre-test to the post-test, the *H2* was supported by the results within the higher track that the experimental group improved significantly more in the post-test within the three domains than the control group. However, for the medium track, the experimental group did not improve significantly whereas the control group improved more than the experimental group in the spatial domain and in the temporal domain. The same as the improvements for all items, participants at different proficiency levels improved differently from the two learning approaches. Even if the effects of applying the CL-inspired meaningful approach in the abstract domain were positive for the higher track and the medium track, the effects were not significant for the medium track.

In the spatial domain, the 2 × 2 (× 2) ANOVAs showed a very highly significant main effect of *learning*($F(1, 214)=10.37$, $p=.001$, $\eta^2=.05$), a non-significant main effect of *track*($F(1, 214)=.00$, $p=.06$, $\eta^2=.00$), a significant main effect of *group*($F(1, 214)=4.23$, $p=.041$, $\eta^2=.02$), a significant interaction of *learning* × *track* × *group*($F(1, 214)=5.22$, $p=.023$,

η^2=.02). The significant interaction indicated that from the pre-test to the post-test, the effects of applying the CL-inspired meaningful learning approaches compared to the traditional rote learning approach had different influence on the different tracks. The higher track improved more by applying the CL-inspired meaningful learning approach than the medium track. By contrast, the medium track improved more by applying the traditional rote learning approach.

In the temporal domain, the 2 × 2 (× 2) ANOVAs showed a significant main effect of *learning* (F(1, 214)=4.78, p=.03, η^2=.02), a non-significant main effect of *track* (F(1, 214)=2.01, p=.16, η^2=.01), a non-significant main effect of *group* (F(1, 214)=.05, p=.82, η^2=.00), a marginally significant interaction of *learning* × *track* × *group* (F(1, 214)=3.13, p=.079, η^2=.01). The marginally significant interaction indicated that from the pre-test to the post-test, the effects of applying the CL-inspired meaningful learning approach had different influence on the different tracks. The higher track improved more by applying the CL-inspired meaningful learning approach than the medium track whereas applying the CL-inspired meaningful learning approach had negative effects on the medium track. The medium track improved more by applying the traditional rote learning approach than by applying the CL-inspired meaningful learning approach.

In the abstract domain, the 2 × 2 (× 2) ANOVAs showed a significant main effect of *learning* (F(1, 214)=30.68, p<.001, η^2=.13), a very highly significant main effect of *track* (F(1, 214)=10.44, p=.001, η^2=.01), a non-significant main effect of *group* (F(1, 214)=1.02, p=.32, η^2=.01), a non-significant interaction of *learning* × *track* × *group* (F(1, 214)=.18, p=.68, η^2=.00). The non-significant interaction indicated that from the pre-test to the post-test, the effects of applying the CL-inspired meaningful learning approach had same influence on the different tracks. However, the degree of the influence was different from the higher track to the medium track. The higher track improved much more by applying the CL-inspired

meaningful learning approach than the medium track. Applying the traditional rote learning approach, the higher track still improved much more than the medium track.

Regarding the improvements between the two tracks, based on the data of one-factor ANOVAs provided in the above section (see 4.1.1.2 and 4.1.2.2), in the Figure 33 below, the descriptive representation of the improvements within the three domains referring the experimental and the control group of the higher and medium track were set up.

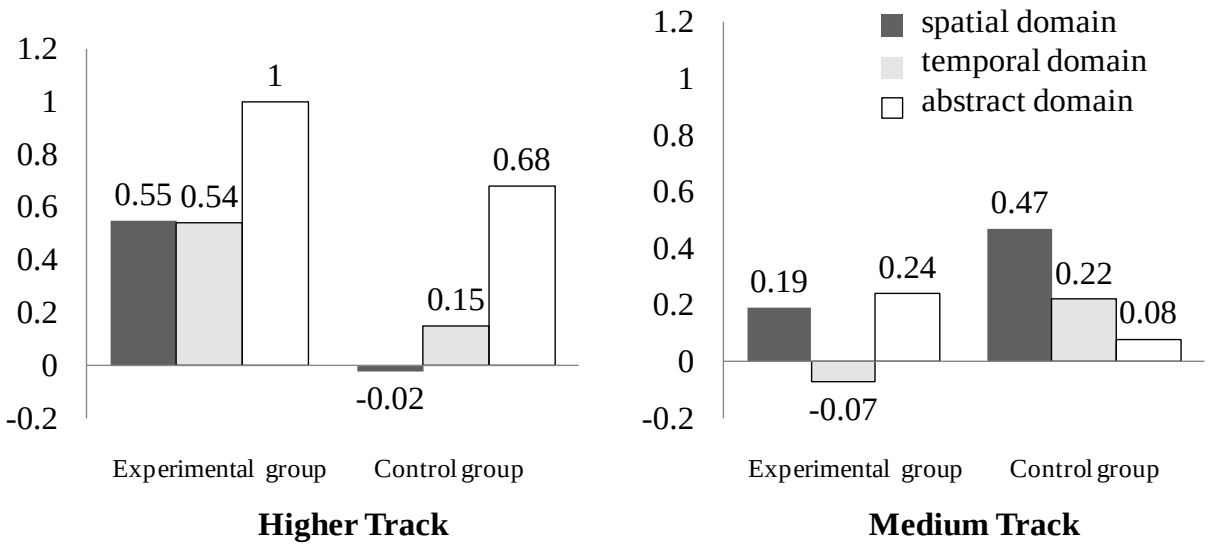


Figure 33. Graph of the mean standardized scores of the items focusing on the improvements from the pre-test to the post-test in the three domains in the experimental and the control group of the higher track and medium track (z-scores)

The descriptive analysis indicated that within the experimental group, participants from both the higher and the medium tracks improved their achievements the most in the abstract domain. In other words, even though participants were at different proficiency levels, they showed the consistent improvement tendency that in the abstract domain they could improve more than other domains. Especially, the higher track having participants at a higher proficiency level also improved a lot in the spatial domain and the temporal domain. Within the control group, participants at different proficiency levels displayed different results that

participants from the higher track were still able to improve more in the abstract domain whereas the participants from the medium track improved the most in the spatial domain. In the spatial and the temporal domain, the control within the medium track had more improvements.

4.2.3.3 Items with the three prepositions (*in, on, at*)

From the pre-test to the post-test, the *H2* was supported by the results within the higher track that the experimental group improved significantly more in the post-test for the preposition *in* and *at* than the control group. For the *on* items, the experimental group also improved more than the control group but was not significant. For the medium track, the experimental group improved more than the control group referring to *in* items but was not significant as well. For *on* and *at* items, the experimental group did not improve more than the control group whereas the control group improved more than the experimental group in the items of *on*. The results of 2 × 2 (× 2) ANOVAs focusing on the three prepositions are displayed as follows.

For the preposition *in*, the 2 × 2 (× 2) ANOVAs showed a very highly significant main effect of *learning* ($F(1, 214)=26.03$, $p<.001$, $\eta^2=.11$), a non-significant main effect of *track* ($F(1, 214)=.34$, $p=.56$, $\eta^2=.00$), a non-significant main effect of *group* ($F(1, 214)=.19$, $p=.66$, $\eta^2=.00$), a marginally significant interaction of *learning* × *track* × *group* ($F(1, 214)=3.36$, $p=.068$, $\eta^2=.02$). The significant interaction indicated that from the pre-test to the post-test, the effects of applying the CL-inspired meaningful learning approach had different influence on the different tracks. The higher track improved more by applying the CL-inspired meaningful learning approach than the medium track. On the contrary, the medium track improved more by applying the traditional rote learning approach.

For the preposition *on*, the 2 × 2 (× 2) ANOVAs showed a non-significant main effect of *learning* ($F(1, 214)=2.01$, $p=.16$, $\eta^2=.01$), a non-significant main effect of *track* ($F(1, 214)=2.63$, $p=.11$, $\eta^2=.01$), a non-significant main effect of *group* ($F(1, 214)=.45$, $p=.51$, $\eta^2=.00$), a non-significant interaction of *learning* × *track* × *group* ($F(1, 214)=1.60$, $p=.21$, $\eta^2=.01$). The non-significant interaction indicated that from the pre-test to the post-test, the effects of applying the CL-inspired meaningful learning approach had different influence on the different tracks. The higher track improved more by applying the CL-inspired meaningful learning approach than the medium track whereas applying the CL-inspired meaningful learning approach had negative effects on the medium track. The medium track improved more by applying the traditional rote learning approach than by applying the CL-inspired meaningful learning approach.

For the preposition *at*, the 2 × 2 (× 2) ANOVAs showed a very highly significant main effect of *learning* ($F(1, 214)=15.47$, $p<.001$, $\eta^2=.07$), a marginally significant main effect of *track* ($F(1, 214)=3.40$, $p=.067$, $\eta^2=.02$), a non-significant main effect of *group* ($F(1, 214)=1.74$, $p=.19$, $\eta^2=.01$), a non-significant interaction of *learning* × *track* × *group* ($F(1, 214)=1.89$, $p=.17$, $\eta^2=.01$). The non-significant interaction indicated that from the pre-test to the post-test, the effects of applying the CL-inspired meaningful learning approach had same influence on the different tracks. However, the degree of the influence was different from the higher track to the medium track. The higher track improved much more by applying the CL-inspired meaningful learning approach than the medium track and the medium track had small improvements by applying the CL-inspired meaningful learning approach. In addition, applying the traditional rote learning approach, the higher track still improved more than the medium track.

Regarding the improvements between the two tracks, based on the one-factor ANOVAs data provided in the above section (see 4.1.1.3 and 4.1.2.3), the descriptive representation of

the improvements of the three prepositions referring the experimental and the control group of the higher and medium track were set up (see Figure 34).

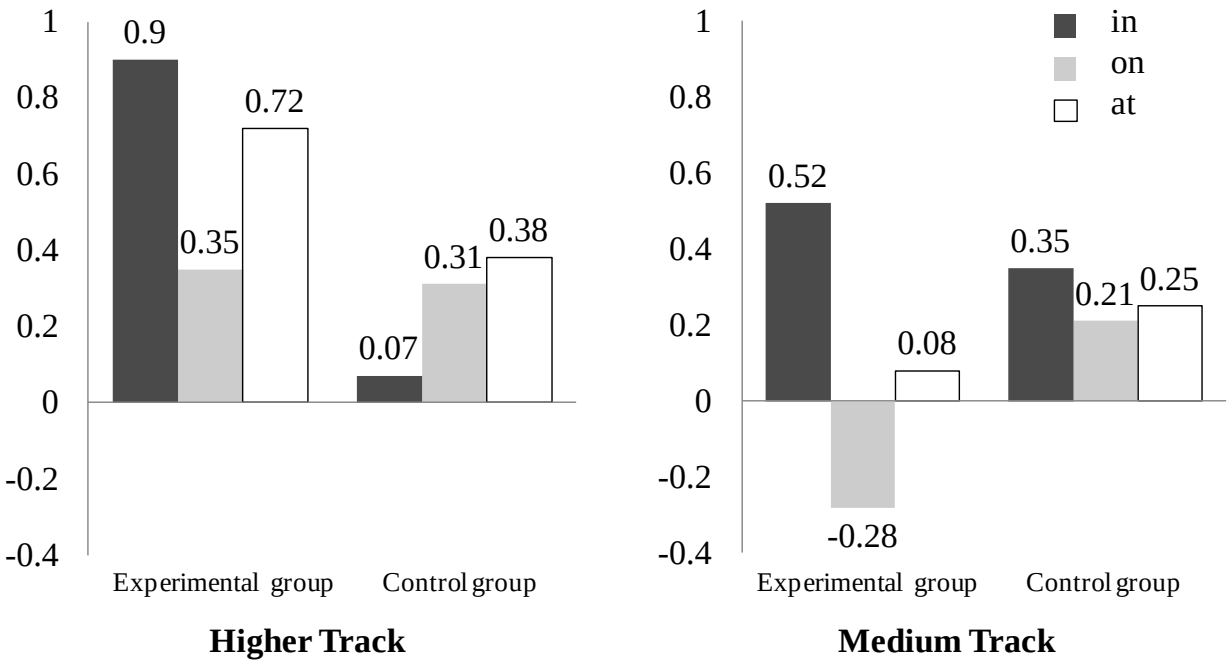


Figure 34. Graph of the mean standardized scores of the items focusing on the improvements from the pre-test to the post-test of the three prepositions in the experimental and the control group of the higher track and medium track (z-scores)

The descriptive analysis indicated that apart from the participants of the control group within the higher tracker, participants improved the most for the items referring to *in*, the medium for the items referring to *at*, and the items of *on* had the lowest improvements. In other words, even though participants were at different proficiency levels, they showed the consistent improvement tendency for many cases that *in* items had the most improvements whereas *on* items were the hardest problem to tackle. As the exception, participants of the control group within the higher tracker displayed different improvement tendency that they improved the most for the items referring to *at*, the medium for the items referring to *on*, and the items of *in* had the lowest improvements.

4.2.3.4 Summary

Generally speaking, the effects of interaction were significant in many cases, including all items, the items in the spatial domain, the items in the temporal domain and the items referring to *in*, which indicated the effects of applying the CL-inspired meaningful learning approach were different within the higher track from within the medium track. The positive effects of applying the CL-inspired meaningful learning approach were stronger within the higher track than within the medium track. The effects of applying the CL-inspired meaningful learning approach within the medium track were negative and the medium track didn't profit from applying the CL-inspired meaningful learning approach to improve their achievements. Nevertheless, that the CL-inspired meaningful learning approach exerts the same influence on the achievements of learners at different proficiency levels was supported by the results in the temporal domain, the items in the abstract domain and the items referring to *at* that both the higher track and the medium track profited from applying the CL-inspired meaningful learning approach, even if the degree of the influence was different that the higher track profited more from applying the CL-inspired meaningful learning approach.

In addition, focusing on the improvements within the three domains, the higher track and the medium track always improved the most in the abstract domain. The only exception was found in the control group within the medium track that they improved the most in the spatial domain, the medium in the temporal domain and the least in the abstract domain. As the higher track having the participants at a higher proficiency level, they would have less change to improve the achievements than the medium track. The fact was that the higher track improved much more than the medium track by applying the CL-inspired meaningful learning approach within the three domains. Focusing on the improvements of the three prepositions, the higher track and the medium track generally improved the most of items *in*, the medium of items *at* and the least of items *on*. The control group within the higher track

displayed different improvements tendency that participants improved the most of items *at*, the medium of items *on* and the least of items *in*.

4.3 Results of Hypothesis 3 Focusing on the Deep-seated Factors within the Higher Track and the Medium Tracks

There are multiple deep-seated factors that have influences on the second language acquisitions. Affective factors such as language shock, culture shock, attitude, motivation and ego permeability were related to second language acquisition (cf. Schumann, 1975). There were individual differences which would affect the second language acquisition, such as age, foreign language aptitude, emotion, and the like (cf. Dai, 2010). Gardner and Lambert (1959) pointed out that a linguistic aptitude and a motivational factor were related to ratings of achievement in French for Montreal high school students. The first language has a crucial role to play in a second language acquisition research and practice (cf. Krashen, 2002). In the present study focusing on how German students acquire the English preposition in a second language, we take the influence of first language into account in the statistic point of views.

Whether the items corresponding with the mother tongue translation would affect the achievements was examined by computing correlation. Firstly, correlations between the achievements of the items in the tests and the number of corresponding items within the tests for the higher and the medium track in the post-test (z-scores) were computed separately. The analyses revealed a significant correlation between the achievements of the items in the tests and the number of the corresponding items in the tests, within the higher track was (r=.65, p=.04) and within the medium track was (r=.64, p=.04). The results indicated that mother tongue translation as one kind of prior knowledge in first language had significant correlation with the achievements. The more items corresponding with mother tongue were involved in the tests, the higher achievements participants got. The correlations between the

achievements of the items in the tests and the number of the non-corresponding items in the tests based on the post-test (z-scores) were also computed for the higher track and for the medium track as well. The correlation analysis revealed a non-significant correlation between the achievements of items in the tests and the number of the non-corresponding items in the tests, within the higher tracks was (r=-.18, p=.32) and within the medium track was (r=-.11, p=.39). These results indicated that within the higher track and the medium track participants displayed lower achievements when the non-corresponding items had bigger number in the test. Secondly, considering the achievements of the experimental and the control group within the higher and the medium track in the post-test, the graphical representation of the correlation between the achievements of the items in the tests and the number of the corresponding items in the tests is illustrated below (see Figure 35). The number of the items in the test is described by the percentage. For example, in the tests there were 12 items of *in* within the spatial domain. The number of corresponding *in* items within the spatial domain in the tests was 10. Thus, the percentage of the number of corresponding items in the test is 83.33% and in the Figure 32 it is expressed as .83 on the horizontal axis.

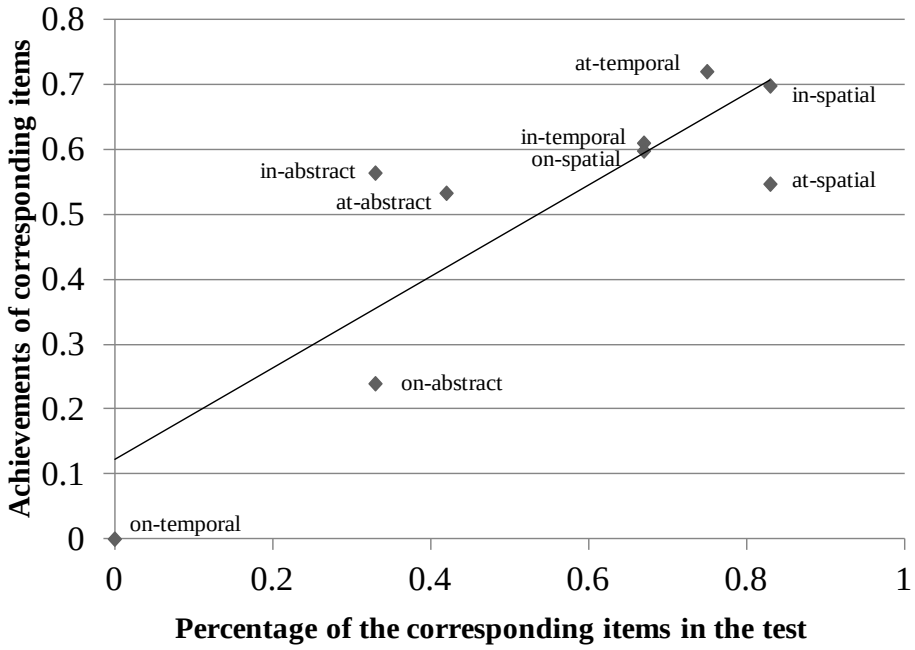


Figure 35. Correlation between the achievements of corresponding items and the percentage of the corresponding items in the test for the higher and the medium tracks in the post-test (z-scores)

In Figure 35, the achievements of the items in the tests and the number of corresponding items in the tests referring to the higher track and the medium track revealed a highly significant correlation (r=.73). Generally, in the spatial domain and in the temporal domain, the achievements of the items in the tests were more correlated with the number of corresponding items in the tests. By contrast, the achievements of the items in the tests within the abstract domain had lower correlations with the number of corresponding items in the tests.

In the spatial domain, all the three prepositions had greater number of corresponding items in the tests and the achievements of the items were also relatively higher. The *in* items had the biggest number of corresponding items in the tests and higher achievements. The *at* items also had the biggest number of corresponding items in the tests but the achievements of

the items in the tests didn't as high as the number of corresponding items in the tests. For the *on* items, higher correlation was found between the achievements of the items in the tests and the number of corresponding items in the tests. The items referring to *on* had higher achievements in the post-test as well as had bigger number of corresponding items in the tests. In the temporal domain, for *in* and *at*, the correlation between the achievements of the items in the tests and the number of corresponding items in the tests was significant. As a reminder, preposition *on* had no corresponding items in the tests and thus no correlation could be computed. The items of *at* had the biggest number of corresponding items in the tests and the achievements of the items in the tests were the highest. Comparing with *at* items, the items of *in* displayed more significant correlation between the achievements of the items in the tests and the number of corresponding items in the tests. The lower achievements of the items in the tests correlated with smaller number of corresponding items in the tests. In the abstract domain, the correlation between the achievements of the items in the tests and the number of corresponding items in the tests was not as significant as in the other two domains.
The lowest achievements of *on* items in the abstract domain had smaller number of corresponding items in the tests. The items in the abstract domain referring to *in* and *at* also had smaller number of the corresponding items in the test whereas they still revealed rather higher achievements of the items in the tests.

To sum up, performing further correlation analysis to explore the deep-seated factors, the items which were corresponding to mother tongue translation had great effect on the achievements. That is, the achievements of the items in the tests had highly significant correlation with the number of corresponding items in the tests.

5 General Discussion

This section first revisits the general research questions of the study posed at the beginning. The effects of the learning English prepositions *in*, *on* and *at* by CL-inspired meaningful learning as well as traditional rote learning applied within the higher and the medium track is discussed in light of the ITPC model and cognitive principles in the CL field. Following the discussion of the research questions, the major findings of the study are presented in the order of the related three hypotheses. *H1* is tested to support the first two research questions concerning the profiles of achievements in the post-test based on the comparison (within each track and between the two tracks) between applying CL-inspired meaningful learning and applying traditional rote learning. *H2* is also tested to support the first two research questions but concerning the profiles of improvements from the pre-test to the post-test within each track and between the two tracks. *H3* is tested to explore the deep-seated factors that could be rooted in different domains and prepositions as well as stemming from the transfer of the mother tongue and how these factors could impact on the learning process.

5.1 Research questions revisited

The present study centres on exploring the following three questions:

1. Compared with traditional rote learning, does the incorporation of CL-inspired teaching and learning methodology and material into a regular English course of teaching English prepositions at secondary school have different effects on acquiring English prepositions which are reflected by the achievements and the improvements after learning?

2. Will CL-inspired teaching and learning methodology and material exert the same degree of influence on the learners at different proficiency levels?

3. Are there any deep-seated factors constraining the learning of English prepositions by rote learning or meaningful learning? How and to what extent do these factors impact the learning process?

5.2 Discussion of the Empirical Results

This section discusses the findings from the empirical study that are related to the three research questions. The general organization of this section presents the results of the different hypotheses separately one after the other.

5.2.1 Comparison between CL-inspired meaningful learning and traditional rote learning focusing on the achievements in the post-test

This section discusses the findings focusing on the first research question. The results of the achievements in the post-test indicate that the participants in the experimental group within the higher track performed better on all items, the items across the three domains and the items with the three prepositions than the control group. This study produces results which corroborate the findings of several theoretical findings in the field. On the contrary, the results fail to support *H1* within the medium track. Further analyses of the results between the higher track and the medium track are also discussed, in order to find out the reasons for the first research question.

5.2.1.1 Comparative study within the higher track

This part focuses on the first research question and discusses the findings in the order of all items, the items in the three domains, and the items referring to the three prepositions.

With respect to all items, the statistic computation of the two learning approaches provided positive results: that is the experimental group significantly outperformed the control group in the post-test. Prior studies have noted the importance of meaningful learning

that “connect[s] or integrate[s] the new concepts or ideas with related ideas in the cognitive structure” (Novak & Cañas, 2009) and the limitation of rote learning that is based on repetition and fails to involve the mental storage of items being associated with existing cognitive structures (cf. Ausubel, 1963, 1968, 2000). The findings, that referring to all items applying CL-inspired meaningful learning get significantly better achievements, corroborated the ideas of the prior studies and further implied the advantages of CL-inspired meaningful learning. Based on the ITPC model and the application of CL-findings, CL-inspired meaningful learning underwent the continuum procedure of learning. At first, CL-inspired meaningful learning provided image schemas which helped the participants to perceive the information by visual images and also provided written texts for assistance. This step corresponded to the visual register, during which process the visual images and written texts were included. During this step, the teachers also explained the application of image schemas to the sample sentences, which corresponded to the auditive register. All these steps were concluded in the process of the sensory register, that is through the auditive channel and visual channel the new knowledge was involved in the first step of comprehension. Then the conceptual metaphor was applied to think about the relations between the image schemas and the questions in the teaching materials and in the test. The comprehension of prepositional meanings included two parts that either understood the non-metaphor prepositional meanings directly in the source domain or understood the metaphorical prepositional meaning by projecting the inference from the source domain to the target domain. This procedure was concluded in the process of the working memory. Finally, after processing the whole procedure, the new knowledge was mapped onto the cognitive schemata, associated with the prior knowledge in the long term memory and then the new knowledge was acquired. Here, the domain as a cognitive domain as well as a conceptual domain plays an important role. First, the cognitive domain provides evidence for knowledge classification, which may

facilitate the integration of new knowledge into the existing cognitive structure. Secondly, the knowledge in the spatial domain (as a conceptual domain) provides the prior knowledge as much as possible for the integration with new knowledge. It elaborated the underlying factors that have influence on learning English preposition. Accordingly, the participants in the experimental group processed the whole procedure and profited from acquiring English prepositions by CL-inspired meaningful learning. Here, the spatial usages in the spatial domain play an important role in integrating the information in the working memory with cognitive schemata, which are retrieved from the long term memory. Space has a privileged position as a foundational ontological category in language (Ming, 2011). Thus, the understanding of the spatial domain holds a central position in the cognitive world (Gou, 2004; Zhou, 2001). In English, spatial layouts are usually represented by prepositions (cf. Landau & Jackendoff, 1993; Zlatev, 1997; Ming, 2005) that "preposition[s] describe the location of the target in relation with both relata" (Baltaretu et al., 2013). Acquiring the spatial prepositions in the first language is learning to categorize spatial relationships according to the spatial cognitive norms conventionalized in first language (Ma, 2005). The second language learning of spatial semantics is a process of rebuilding the spatial system in the cognitive schemata according to the target language criteria (Ma, 2005). Our bodily sensations, our experience of space, of objects in space, of forces acting on these objects, provide the basic structures, which metaphor enables us to conceptualize in ever more abstract cognitive domains. Thus, the phenomenon of English preposition as polysemous items in language can be explained by the metaphorical mappings of image schemas, which are systematically organized and rooted in recurring bodily experiences and interactions with the world. Moreover, for the participants in 7th grade, normally the order in which they learn the usages of English preposition is from concrete ones to abstract ones. Generally, concrete usages, mostly in the spatial domain, are relatively easy to learn and result in easy perception.

Consequently, concrete usages are the easiest to be mapped onto the cognitive structure, during which procedure the ability of conceptual metaphor is developed. In other words, the creativity of expending prepositional semantics is fostered by meaningful learning during these procedures. However, traditional rote simply crams the knowledge. Especially, focusing on English preposition, learning traditionally by rote was giving the definition of every preposition in a straightforward manner. Without experiencing the procedure of thinking, the participants just learn the knowledge for homework and for further exams. They skipped the procedure of integrating the new knowledge into their prior knowledge and thus failed to draw links between the different meanings of one preposition. Such acquired knowledge is easily to forget. Therefore, the participants in the experimental group applying CL-inspired meaningful learning resulted in significant better achievements in the post-test than the control group where traditional rote learning was practiced.

Referring to the findings of the three domains, *H1* was partly supported and CL-inspired meaningful learning made contributions at different levels. On the one hand, the experimental group showed significantly better achievements than the control group in the temporal domain and in the abstract domain. Following the theory of development suggested by Piaget (cf. 1952a), hypothetical-deductive reasoning takes place by the time children are about 12 years old, which marks the development of formal operational thinking. In the present study, 7th grade participants, who are about 12 years old and characterized by the ability to use logical and coherent actions in thinking and solving problems, are just in this time span. Thus, participants have the physical foundation to operate formal operational thinking and develop their cognitive abilities of reasoning thinking. In other words, metaphorical mappings which allow inferences by deductive and hypothetical thinking, have physical foundations to project image schema from the source domain onto the target domain. Thus, applying CL-inspired meaningful learning has the foundation to result in better achievements than applying

traditional rote learning approach. Vasta and Liben (1996) suggested that students may tend to use formal operations with proper instructions. Teaching and learning with well-structured approaches, participants were able to learn the new knowledge about prepositions by mapping the image schema (which is abstracted from the spatial concepts) cross a domain onto the abstract concepts. The significant better achievements by applying CL-inspired meaningful learning in the temporal and the abstract domain corroborated the findings. Through metaphorical mapping, the participants in the experimental group integrated the usages of the temporal into the spatial domain as well as the abstract domain into the spatial domain with significant achievements in the post-test. That is, the abstract usages (within the temporal and the abstract domain) were regarded as new knowledge and they were mapped onto the target domain by conceptual metaphor and integrated with relevant spatial prior knowledge. During the procedure of the working memory, the new knowledge can be held in the cognitive structure by metaphor (cf. Ausubel, 1963, 1968, 2000). However, in the control group, participants applying rote learning only learnt fixed and relatively isolated structures. As the features of rote learning that participants lacked of the linking between new knowledge and prior knowledge, participants in the control group did not need inferences by deductive thinking and failed to show significantly better achievements. On the other hand, the students from the experimental group failed to display significantly better achievements in the spatial domain than the control group but only performed slightly better than the control group. Because 7th grade students most likely have more prior knowledge in the spatial domain than in the other two domains in the English and because participants have nearly learnt all the spatial usages of these three basic prepositions, different teaching approaches showed similar effects. Moreover, focusing on the tendency of achievements of the three domains, both the experimental group and the control group performed best in the spatial domain, medium in the temporal domain and worst in the abstract domain. As the

concrete spatial usages were the easiest to be mapped onto the cognitive structure and participants at a higher proficiency level had more prior knowledge in the spatial domain in English, the achievements in the spatial domain were best. Even though 7th grade students have the ability to use logical and coherent actions in thinking and solving problems, they are still at the beginning of formal operational thinking and their abstract thinking in the temporal and abstract domains has not yet developed to the full standing (cf. Piaget, 1952a). Hence, the achievements in the spatial domain for the experimental group and the control group were still better than the achievement in the temporal domain and in the abstract domain. The students are able to map the image schema by metaphor across the domains, but to map across the temporal domain and the abstract domain, they still have difficulties and need more support and practice.

With regard to the items referring to the three prepositions, *H1* was partly supported. Generally speaking, as CL-inspired meaningful learning corresponds to the ITPC model, which aimed at preventing cognitive overload by reducing extraneous load, the abstracted image schemas may make a major contribution to the outperformance of the participants in the experimental group. Thus, for the three English prepositions in general, the participants in the experimental group all performed better than the participants in the control group. Generally, CL-inspired meaningful learning in the experimental group made contributions at different levels. Regarding the items of *in*, *H1* was fully supported, that is the experimental group showed highly significantly better achievements than the control group. Considering the CL theoretical background, the image schema of *in* was related to two major parts including the static image schema CONTAINMENT referring to three different dimensions, and the final state of CONTAINMENT after a dynamic process. Compared with the other two prepositions' image schemas, the image schema of *in* was more uniform and much simpler to tackle. Hence, the achievements of *in* items revealed highly significant differences between

the experimental and the control group. However, according to the items referring to *on* and *at*, the experimental group only outperformed the control group. Admittedly, the image schemas of *on* and *at* is more complex than the image schema of *in*. And the structure V+ P+ N_1 seems to have influence on the right use of *on* and *at*. In the example, *Thomas is sitting at the computer*, participants preferred to use *sit on the computer* to complete the sentence. Due to the fact that *sit on* is normally taught as a combination, participants generally use *on* directly. However, in some special cases, *at* could be more suitable, such as *at the computer* in virtue of *at the table*. Traditional rote learning, which was dictionary-based and followed a rule-plus-exceptions approach, may have more extraneous information and bring a cognitive overload. In short, image schemas of prepositions may reduce the extraneous cognitive load which results in the experimental group outperformed the control group. Image schemas at different difficulty levels could have different influence on the achievements.

5.2.1.2 Comparative study within the medium track

The first research question addressed the effect of CL-inspired meaningful learning on the acquisition of English prepositions, and the achievements of the participants at a lower proficiency level from the medium track were reported.

With respect to all items, the statistic computation of both teaching approaches provided negative results: the experimental group could not outperform the control group. Participants in the experimental and the control group benefited from the two teaching approaches at a significant level. However, the findings within the medium track do not support previous research. Participants at a lower proficiency level failed to demonstrate the contribution of CL-inspired meaningful learning.

Referring to the findings of the three domains, *H1* failed to be supported within the medium track and CL-inspired meaningful learning approach only resulted in slightly better

achievements in the abstract domain. The control group participants did significantly better in the items within the spatial and the temporal domain and had more stable achievements across the three domains. For lower proficiency students, applying traditional rote learning by presenting the definitions across the three domains, the definitions helped them to refine their knowledge in the cognitive structure more directly than CL-inspired learning. They omitted the procedure of reasoning the relationship between the perceived information and the information in the cognitive schemata. The application of English prepositions in the spatial and the temporal domain seemed more concrete to them, and the only endeavour they need was to refine their prior knowledge by learning definitions and rules. On the contrary, CL-inspired meaningful learning was more abstract and complex, which forces participants to pay more attention to embody experience and to associate the image schemas with examples from the source domain onto the target domains. With lower proficiency and probably lower cognitive ability, the participants from the medium track benefited more from traditional rote learning than CL-inspired meaningful learning. To sum up, participants within the medium track failed to benefit from CL-inspired learning by reasoning which may have negative influence on fostering creativity as well as further achievements of prepositions.

With regard to the items referring to the three prepositions, *H1* could not be supported. CL-inspired meaningful learning did not contribute at a significant level to the achievements and only displayed better achievements on the items referring to *in*. As mentioned above, the image schema of *in* is more uniform and much simpler to tackle. Thus, participants could benefit more from this CONTAINMENT schema with less overloaded information than from the definitions with more extraneous load. For the medium track participants, it could be assumed that such image schema would be slightly less difficult than learning all the definitions by rote. Referring to the items of *on* and *at*, participants at a lower proficiency

level had more problems in correctly decoding them by CL-inspired meaningful than by traditional rote learning.

5.2.1.3 Comparison between the higher track and the medium track

Generally speaking, the comparison between the higher track and the medium track on applying CL-inspired meaningful learning and traditional rote learning revealed widespread significant interaction of *track* × *group*, including a significant interaction for all items, a significant interaction for the items in the spatial domain, a significant interaction for the items in the temporal domain, and a marginally significant interaction for the *on* items, a marginally significant interaction for the *at* items. For the items in the abstract domain and for the *in* items, there was no significant interaction of *track* × *group*.

The influence factors of students' achievements in secondary school are complex, including the factor of family background, the school quality, the achievement-oriented school culture, students' heavy burden, and the students' individual differences (Ma, 2011). The significant effects of interaction are consistent with those of Cronbach and Snow (1977), who found optimal learning occurs when instruction matches the aptitudes of the learners which is so-called theory of Aptitude Treatment Interaction (ATI). Regarding the research paradigm of ATI, the aptitudes of the learners include any individual difference variable which may moderate the effects of a treatment on an outcome (Cronbach & Webb, 1975) and cognitive abilities, cognitive and affective characteristics of learners (Snow, 1989, 1992). In the present study, the effects of applying CL-inspired meaningful learning depend on the interaction between students' individual differences and the type of teaching instruction, matching or mismatching students' learning strategy, cognitive ability and the like. The 7th grade participants in the present study have already studied more than two years within different tracks. The higher track provides direct entry into university education and the

students in grammar school generally have better performance and more solid knowledge basics than the medium track. Being unconsciously influenced by different school quality as well as teaching practice, the participants in the higher track may have a stronger ability in hypothetical-deductive reasoning and thinking, and are able to project the image schemas from the source domain to the target domain by metaphorical mappings. On the contrary, participants at a lower proficiency level may be used to acquire knowledge directly by rote rather than to associate the new knowledge to the prior knowledge. Thus, regarding the achievements of English preposition in the present study, the greater achievement can be obtained in the higher track. This result may stem from school education and students' individual differences and instructional strategies and treatments which would be effective for particular individuals depending upon their specific abilities (Cronbach & Snow, 1977).

For the items in the abstract domain and for the *in* items, there was no significant interaction of *track* × *group*. Considering the differences between CL-inspired meaningful and traditional rote learning, the former provided abstracted image schemas of prepositions whereas the latter provided multiple definitions. Especially, the definitions in the abstract domain had larger numbers than the numbers in the spatial and the temporal domain. Moreover, the definitions for abstract usages were more difficult to be understood. Thus, even if the participants within the medium track were at a lower proficiency level, they still profited more from CL-inspired meaningful learning, which prevented cognitive overload. Thus, as both tracks profited from CL-inspired meaningful learning, the interaction of *track* × *group* was not significant. Focusing on the *in* items, the image schema of *in* is more uniform and much simpler to tackle. As mentioned above, the image schema of *in* is related to two major parts. These four image schemas share the same connotation and only differ by the extent of extension. With the same amount as that of *in*, the image schema of *on* included CONTACT, SUPPORT, PRESSURE, CONSTRAINT and PATH, which share a quite different

connotation and extension. The preposition *at* has only four image schemas that are CONTAINER, ADJACENCY, LINAR-RELATION, and DYNAMIC-RELATION, which also differ in connotation and extension. Thus, the participants within the higher track and the medium track are able to apply the image schema of *in* more effectively than the other two prepositions' image schemas and result in no significant interaction of *track* × *group*.

Apart from the interaction of *track* × *group*, the achievements of the experimental group showed a significant effect of *domain* (*spatial/ temporal/ abstract*) within the higher track whereas in the medium track, the effect of *domain* was not significant. The achievements of participants in the higher track indicated that they had the ability to apply image schemas as well as conceptual metaphorical mappings in different domains. Participants performed better on their familiar usages of prepositions (normally come from the usages in the spatial and the temporal domain) than the unfamiliar usages (normally from the usages in the abstract domain). In the medium track, there was a non-significant effect of *domain*: the participants at a lower proficiency level failed to be aware of the differences among the three domains. Hence, the learning strategy for the medium track is still learning prepositions by rote that match certain definitions with exceptions and students tend to translate the target item into the mother tongue in order to find a corresponding German preposition.

Focusing on the effect of *preposition* (*in/on/at*), the achievements of the experimental group showed a highly significant effect within the higher and the medium track. As mentioned above, the difficulty of the three prepositions' image schemas were at different levels. Accordingly, the experimental group within the higher track and the medium track applying CL-inspired meaningful learning displayed different achievements for the three prepositions.

5.2.2 Comparison between CL-inspired meaningful learning and traditional rote learning focusing on the improvements from the pre-test to the post-test

This section discusses the findings of the comparative study from another point of view: the improvement from the pre-test to the post-test. The improvements of the students focusing on overall items, the items across three domains as well as the items referring to the three prepositions were reported. Firstly, the improvements of the participants at the same proficiency level within the higher track and within the medium track, which were related to the first research question, were reported with the aim of assessing the effectiveness of the CL-inspired meaningful approaches to teaching English prepositions. Secondly, the improvements of the participants at different proficiency levels between the higher track and the medium track, which were related to the second research question, were reported.

5.2.2.1 Comparative study within the higher track

The improvements of the participants from the higher track based on the data designed for *H2* and attempted to answer the first research question from the profile of improvements.

With respect to all items, the statistical computation of both teaching approaches provided positive results: the experimental group improved highly significantly more than the control group. And these improvements confirmed prior studies as the achievements mentioned before. The detailed analysis of the results within the three domains and of the three prepositions is discussed below.

Regarding the items within the three domains, highly significant improvements were found. The significance of improvements increased from the most abstract usages in the abstract domain to the most concrete usages in the spatial domain. The improvements in the three domains were all significant: the improvements of participants in the experimental

group were significantly more than the improvements of participants in the control group. The experimental group improved the most significantly in the abstract domain, the improvements in the spatial domain and in the temporal domain were medium and similar. Whereas in the control group, the achievements in the spatial domain decreased mildly, the improvements in the temporal domain were medium and the improvements in the abstract domain were very high. The comparison of improvements between the experimental and the control group related to their achievements in the post-test. Focusing on the degree of improvements and how the experimental group improved more than the control group, the most significant interaction was found in the spatial domain, the medium significant interaction was in the temporal domain and the lowest was in the abstract domain. The image schema originated from the spatial domain. With the most concrete visual examples, participants in the experimental group displayed the highest significant improvements. In the control group, the participants at a higher proficiency level had already accumulated enough prior knowledge in the spatial domain. When the participants faced the familiar usages, the traditional rote learning would help to catalogue the applications rather than to improve the achievements. According to this, with interference to prior knowledge, the participants at a higher proficiency level tended to avoid the application of traditional rote learning to acquire the knowledge they have learnt before. Thus, the participants in the control group displayed decreased achievements in the spatial domain and less improvements in the temporal domain. That is, the reason for the impressive improvement results may relate to the different amount of prior knowledge in the three domains and relate to the different roles played by CL-inspired meaningful learning and traditional rote learning in acquiring the spatial and the temporal usages. Even if the participants of the present study have more prior knowledge in the spatial domain and in the temporal and the abstract domains, they have the least knowledge in the abstract domain.

The survey by Cuyckens et al. (2007) presented the frequency of response types for the prepositions *in, on* and *at*. It showed that the spatial usages of all three prepositions had the highest frequency and the temporal usages had medium frequency. In addition, Anderson and Pichert (1978, p. 1-12) wrote that "[t]he knowledge a person possesses has a potential influence on what he or she will learn and remember…". Also one of the foremost results of cognitive psychology is the consciousness that "prior" knowledge plays an important role in the acquisition of "new" knowledge. Here, the spatial usages were considered as prior knowledge and the abstract usages, particularly in the abstract domain, were regarded as new knowledge. Moreover, according to the results from Parkerson et al. (1984), who proved that prior knowledge has significant correlation with achievement (r=.72), the prepositional usages in the spatial domain correspond to 7th grade students' prior knowledge and thus have a great impact on acquiring knowledge about prepositions for the temporal and the abstract domain. Usages in the spatial domain could provide more prior knowledge, which can be integrated into the existing conceptual structures, than the usages in the temporal and abstract domains. As a result, the significant level of improvements for the experimental group is the highest in the abstract domain. Similarly, in the control group, participants have more motivation to acquire new knowledge, which is reflected by the significant improvements in the abstract domain.

For the items referring to the three prepositions, the data of improvements were consistent with that of the achievements. The experimental group improved highly significantly more on the *in* items than the control group, significantly more on the *at* items than the control group, and more on the *on* items than the control group. The reason may relate to the difficulty of different image schemas as well. Therefore, applying CL-inspired meaningful learning had the most effectiveness on the improvements of *in* items. Only the items referring to *on* in the temporal domain displayed negative results which may relate to

the complexity of *on*'s image schema and also relate to the interference of mother tongue translation that is discussed later.

5.2.2.2 Comparative study within the medium track

As another profile of the first research question, this section compared the improvements within the medium track, which based on the application of traditional rote learning and CL-inspired meaningful learning.

With respect to all items, the statistic computation of both teaching approaches failed to support *H2* and the experimental group could not improve more than the control group. As mentioned in the discussion of the achievements for the first research question, the findings of the current study do not support the previous research. Participants at a lower proficiency level were unable to demonstrate the contribution of CL-inspired meaningful learning; they could not to improve their acquisitions of English prepositions by applying CL-inspired meaningful learning.

Referring to the findings of the three domains, *H2* failed to be supported within the medium track and in the experimental group CL-inspired meaningful learning only made a slight contribution to the items in the abstract domain. The control group participants improved more in the items within the spatial and the temporal domain than the experimental group but not at a significant level. Within the three domains, no significant interaction was found between the experimental and the control group. The participants at a lower proficiency level had lower cognitive ability to perform reasoning thinking and CL-inspired meaningful learning and traditional rote learning had similar teaching effects.

With regard to the items referring to the three prepositions, *H2* failed to be supported as well. In the experimental group, CL-inspired meaningful learning did not contribute at a significant level to the improvements and only displayed better achievements in the items

referring to *in*. However, for the medium track students, the image schema did not have any positive effect on the improvements of *on* and *at* items. Traditional rote learning resulted in more improvements of the participants referring to the three prepositions. Accordingly, the differences between applying CL-inspired meaningful learning and traditional rote learning were not significant for the experimental group and the control group.

5.2.2.3 Comparison between the higher track and the medium track

The statistic results of the improvements of the experimental group and the control group within the higher track and the medium track revealed a significant effect of interaction for all items, a significant effect of interaction for the items in the spatial domain, a marginally significant effect of interaction for the items in the temporal domain, a non-significant effect of interaction for the items in the abstract domain, a marginally significant effect of interaction for the *in* items, a non-significant effect of interaction for the *on* items, and a non-significant effect of interaction for the *at* items. Apart from the items in the abstract domain, the *on* items and the *at* items, in most cases, the effects of applying CL-inspired meaningful learning were different within the higher track in comparison to the medium track. The positive effects of applying CL-inspired meaningful learning were stronger within the higher track than within the medium track.

Generally speaking, the significant effects of interaction also support previous research into the ATI from the aspect of improvements. Family factors could also have great effects on the individual differences and cognitive abilities which further impact the improvements of English preposition acquisition. Participants from different tracks could have different effects on them and are intrinsic in nature of activating cognitive abilities which is the capacity to perform higher mental processes of reasoning, remembering, understanding, and problem solving (cf. Bernstein et al., 2006; Craig, T.N., Kay, P., & Johnson, R.C., 1987). Different

cognitive abilities were bound to the fact that for higher track participants would be more able to apply conceptual metaphor, to reason the projective mapping, to remember the association between domains, to understand the connotation of the image schemas and to solve the prepositional problems than the participants from the medium track. Moreover, according to cognitive load theory (e.g. Paas, Renkel & Sweller, 2004), the CL-inspired meaningful learning may bring more cognitive load to the participants within the medium track. During complex learning activities, the amount of information and interaction may overload the finite amount of working memory the lower proficiency level proficiency level participants processed. For the participants within the higher track, the information can be processed under-load. Thus, for most cases, the participants within the higher track at a higher proficiency level normally improved more by applying CL-inspired meaningful learning than the participants within the medium track. There were a significant effect of interaction for the items in the spatial domain and a marginally significant effect of interaction for the items in the temporal domain. The spatial usages of English prepositions are no doubt considered as prior knowledge, and 7th participants also have learnt many temporal usages. With big amount of prior knowledge, CL-inspired meaningful learning associated these to cognitive schemata and therefore, the effect of interaction for the spatial and the temporal domain was significant. It corroborated the findings of Jonassen and Land (2000) that the prior knowledge is important in meaningful learning. As scaffolded thinking facilitates authentic problem solving and the constructed thought, the spatial usages, serving as scaffolds, provide image schemas for cross-domain mappings. Compared with the usages in the abstract domain, the temporal usages may be perceived by metaphorical mappings more easily. Accordingly, for knowledge acquisition on English prepositions, the spatial usages provided scaffolded thinking in solving prepositional problems, which resulted in the significant effect of interaction in the spatial domain and the temporal domain.

The interaction of *learning* × *track* × *group* was not significant in the abstract domain. Similar as the achievements, both tracks had more chances to learn the abstract usages and CL-inspired meaningful learning may reduce more cognitive load than the traditional rote learning approach. It is worthy to point out that even though the higher track participants have had more prior knowledge in the spatial and the temporal domain than the control group (in the pre-test, the higher track performed significantly better than the medium track), they still improved more than the medium track by applying CL-inspired meaningful learning. These findings further support that before systematically learning English prepositions, the students show low achievements in using prepositions correctly. In addition, providing an effective learning approach could improve the achievements for both the medium track and for the higher track. Moreover, the higher track applying CL-inspired meaningful learning profited more than applying traditional rote learning, which indicated that CL-inspired meaningful learning may assist participants to learn more. Especially, CL-inspired meaningful learning can facilitate the integration of prior knowledge and new knowledge. For the participants learning English as a second language, CL-inspired meaningful learning may help them to associate the embodied experience in the first language to the second language as well. Hence, the higher track still improved more in the spatial and the temporal domain.

Unlike the effects of interaction focusing on the achievements, the effects of interaction focusing on the improvements of *on* and *at* were not at significant level. As noted before, within the medium track, participants did not show improvements of *on* items and less improvements of *at* items. As applying CL-inspired meaningful learning displayed negative effects which seemed harmful to the participants, the interaction of *learning* × *track* × *group* was not significant. And the difficulty for the medium track to apply CL-inspired meaningful learning stemmed from the complex image schema of *on* and *at* as well as the participants' lower proficiency level.

5.2.3 The deep-seated factors constraining the learning of English prepositions by rote learning and meaningful learning

In this section, the deep-seated factors are discussed from the aspects of mother tongue translation and the feedback from teachers.

The correlation between the achievements of the items in the tests and the number of corresponding with the mother tongue translation items in the tests was significant. Due to the fact that there was no corresponding item of *on* in the temporal domain, the number of corresponding items referring to *on* was the smallest. Thus, participants had only few opportunities to translate the prepositions to the right mother tongue preposition. The corresponding items of *at* had the biggest amount and even if the image schema of *at* is more or less complex, the achievements of these items in the post-test were still high. Many findings of second language acquisition demonstrate that the mother tongue can be seen as a cognitive element (Corder, 1967) and the "relative ease or difficulty in acquiring some feature of the target language crucially depended upon the similarity or diffierence it bore to the mother tongue" (Corder, 1994, p. 21). Concerning second language acquisition, the transfer of mother tongue plays either positive or negative roles (cf. Liu, 2011). The participants in the present study were 7th grade students who still lacked knowledge of the English language system. As participants with lower proficiency tend to learn the foreign and second language assisted by the mother tongue (cf. Huang, 2011), especially, the medium track participants could have to resort to their first language in the second language production. Both German and English are under the influence of Romance languages and they have some overlaps: "English is a Germanic language at the lexical level" which "shares few similarities with the rest of the Germanic languages" (Angelovska & Hahn, 2012, p. 25). Therefore, having a similar language system and sharing some properties, it's easy for

German learners to learn English as a second language and the influence of mother tongue transfer could be positive and play a promoting role.

Beside, apart from discussing the deep-seated factors on the data above, there are several possible explanations for these results according to the teachers' feedback. Concerning the performance in the control group, most teachers gave the feedback that students showed boredom when they learnt English prepositions by rote. On the contrary, in the experimental group, students showed a lot of enthusiasm by making metaphorical mappings, for instance, the teacher asked what can be regarded as a container and the students answered "classroom, bag, car..." for example. Employing CL-inspired meaningful learning could help teachers to explain prepositions in an effective way. Teachers do not need to distinguish the senses of each preposition in different contexts but they need to lighten students' burden by providing more understandable explanations to these language phenomena. Image schemas have a considerable explanatory power, especially in the context of English preposition. 7th grade students have the ability to map the image schema across domains by conceptual metaphor. Applying these methods in the experimental group, students can understand and use English prepositions more effectively.

5.3 Summary

To sum up, compared with traditional rote learning, the incorporation of CL-inspired teaching and learning methodology and material into a regular English course of teaching English prepositions at secondary school for students at a higher proficiency level has significant effects, which are reflected by the achievements and improvements. This study produced results which corroborate the findings of a great deal of the previous work in this field, involving the meaningful learning theories as well as the ITPC model. Participants at a higher proficiency level have the ability to perform formal operational thinking and thus

during the procedures of meaningful learning, the advantages of the CL-inspired meaningful learning became obvious by the learners' achievements and improvements.

Participants from the medium track at a lower proficiency level benefited more from traditional rote learning. Even if rote learning is based on simple repetition, the participants with lower cognitive ability could learn the definition of each preposition by cramming. Without the procedures of activating related prior knowledge and constructing integrated structures, the participants may acquire the fixed isolated knowledge of certain preposition, although their cognitive linguistic skills could be less developed. However, because the image schema of *in* is easy to follow and the explanations for abstract usages are simple to remember, participants at a lower proficiency level still profit more from CL-inspired meaningful learning in this case than for traditional rote learning.

Comparing the achievements and the improvements between the higher track and the medium track, the interaction effects indicated that the different teaching and learning methods had different effects depending on the participants at different proficiency levels. According to the research paradigm of ATI, the first interpretation is that individual differences may moderate the effects of a treatment on outcomes. The participants within the higher track seem to be able to apply CL-inspired meaningful learning effectively with hypothetical-deductive thinking and other cognitive abilities. Therefore, they can benefit more from CL-inspired meaningful learning. Nevertheless, the participants within the medium track still need more help and practice on developing their cognitive skills in hypothetical-deductive thinking. Thus, the effects of applying CL-inspired meaningful learning were moderated in many cases for the medium track. In nature, the prior knowledge is the important factor to impact the achievements and improvements of participants at different proficiency levels. For instance, the spatial usages of preposition are regarded as the prior knowledge and the amount of the related items in the tests may have influences on the

acquisition of prepositional usages across the three domains. Both the higher track and the medium track had higher achievements of the items in the spatial domain. However, the participants in the higher track performed better and were more able to project the image schema from the spatial domain to the target domain than the medium track. Moreover, in the experimental group of these two tracks, the image schema of *in* displayed more effectiveness than the image schema of *on* and *at*. Regarding the easier image schema of *in*, the medium track was also able to profit from CL-inspired meaningful learning. Hence, the evidence from *in* items indicates that the difficulty of teaching materials would affect the achievements and improvements. In other words, if the image schemas are easier in the teaching material, students may show better achievements and more improvements.

The deep-seated factors constraining the learning of English prepositions by traditional rote learning and CL-inspired meaningful learning may result from corresponding mother tongue transfer. The items corresponding with the mother tongue translation result in higher performances which is the same for both the higher track and the medium track. Moreover, the effects of motivation are different in the experimental and in the control group. Only within the experimental group of the higher track, the participants showed great interest in associating prior knowledge to new knowledge.

6 Conclusion

The contributions of the study is summarized with respect to a) criteria of CL-inspired meaningful learning, b) the comparison of CL-inspired meaningful learning and traditional rote learning on participants at different proficiency levels, and c) the weighted factors on influencing English preposition acquisition. Finally, this part concludes the suggestions for future studies.

When learning a foreign language, the use of prepositions usually causes continuing problems. There is no simple one-to-one mapping between the prepositions in the mother tongue and the foreign language. As a result, teaching the use of prepositions in a foreign language generally follows a rule-plus-exceptions approach. There are a few rules which can be applied in a number of cases. However, these rules are accompanied by many exceptions which have to be learned as well. The predominant way of dealing with prepositions in a foreign language is therefore learning by rote. Based on the results of the present study, this kind of teaching causes non-stable improvements.

In contrast, the use of domain, the notions of image schema and the conceptual metaphor theory in the field of CL can have remarkable effects on the performance of learners in the higher track and lower effects on the performance of learners from the medium track. The CL-inspired approach of teaching prepositions can be rather effective under the condition that students possess sufficient cognitive prerequisites. The results supported the hypothesis that teaching prepositions on the basis of concepts from CL is more efficient than traditional rote learning if these requirements are met. Students in the experimental group within the higher track had stable achievements and improvements after following CL-inspired learning.

As an old Chinese saying goes, “teach students in accordance to their aptitude”. Depending on the participants’ different proficiency levels and concerning their different cognitive abilities, specific and workable teaching and learning approach should be applied.

The participants at a higher proficiency level can profit more from CL-inspired meaningful learning whereas the participants at a lower proficiency level can profit more from traditional rote learning. Focusing on the achievements of items in the spatial domain and the *in* items as well as the improvements of the items in the abstract domain and the *on* and *at* items, the higher track and the medium track all consistently reflected the advantages of applying CL-inspired meaningful learning. Moreover, CL-inspired meaningful learning has more effects on knowledge acquisition and could assist in constructing cognitive schemata. Even if at the beginning the participants with a lower proficiency would have difficulty in integrating new knowledge with relevant prior knowledge by hypothetical-deductive reasoning, more support and practice as scaffold would facilitate their knowledge acquisition as well as their cognitive development.

The deep-seated factors, such as mother tongue transfer, the difficulty of teaching materials and the influence of prior knowledge have great effects on the acquisition of English prepositions. For second language learners, the prepositions in a foreign language with corresponding mother tongue translations are easier to learn. The more concrete teaching materials could make more contribution to the preposition acquisitions than the abstract and indirectly materials. The spatial usages of prepositions as prior knowledge relate to better achievements and play an important role in integrating abstract usages and constructing cognitive schemata.

Although the present study is only a study about the use of *in*, *on* and *at* as a typical example for German students, it once more supports the effectiveness of language teaching by a CL-approach. In future studies, the results extending to other prepositions are expected as well as to other groups or other types of learners, too.

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Appendix

Appendix A. Test materials for the pilot study

Booklet I

I. Choose *in, on, at* or *no preposition* to fill in the blank. Each question has only one correct answer.

1. There is somebody _____ the door. Shall I go and see who it is?
2. The man is flying _____ a plane.
3. I'll meet you _____ the hotel lobby.
4. The match starts _____ 3 o'clock.
5. I'll see you _____ Friday.
6. I'm going _____ business next week.
7. I'll see you _____ the morning.
8. Audiences still laugh _____ his jokes.
9. Franklin began working on the project _____ yesterday.
10. There are 1000 kilograms _____ a tone.

II. Complete the sentences, using *in, on or at* to match the phrase in the table, or using *no preposition*. Each phrase could only be used once.

the sports centre

Example: I play basketball <u>at the sports centre</u> on Friday evenings.

the table	the airport	the front row	the back of this card	the west coast	prison

1. San Francisco is _____ of the United States.
2. We went to the theatre last night. We had seats _____.
3. I don't have your address. Could you write it _____?
4. Linda is sitting _____ opposite her brother.

5. How about go skating _____this Monday?
6. Our flight was delayed. We had to wait _____ for four hours.
7. Some people are _____ for crimes that they did not commit.

Booklet II

I. Choose *in, on, at* or *no preposition* to fill in the blank. Each question has only one correct answer.

1. Every morning Bob is _____the bus stop waiting for the bus.
2. One of the strings _____ my guitar is broken.
3. She's _____ a diet.
4. If the sky is clear, you can see the stars _____ night.
5. We all sat _____ silence.
6. There is some water _____ the bottle.
7. I'm really not very good _____ math.
8. They arrived _____ October.
9. Be _____ time. Don't be late.
10. She went _____ home.

II. Complete the sentences, using *in, on or at* to match the phrase in the table, or using *no preposition*. Each phrase could only be used once.

the sports centre

Example: I play basketball <u>at the sports centre</u> on Friday evenings.

Christmas	few minutes	six months' time	Saturday evenings	present	my birthday

1. They went to China _____ last month.
2. The train will be leaving_____.
3. They're getting married _____.
4. Do you give each other presents _____?
5. Do you work _____?
6. Mr. Benn is busy _____.
7. I've got a special gift _____.

Booklet III

I. Choose *in, on, at* or *no preposition* to fill in the blank. Each question has only one correct answer.

1. The cats spend most of the day sitting _____ the window and looking outside.
2. I like that picturing hanging _____ the wall in the kitchen.
3. What's _____ TV tonight?
4. He is very ill _____ bed. He can't go to school.
5. Mozart was already composing music _____ the age of five.
6. I don't go out _____ Monday mornings.
7. I'll see you _____ next Friday.
8. They arrived _____ 1968.
9. His Ferrari crashed _____ 120 miles an hour.
10. The girls were all dressed _____white.

II. Complete the sentences, using *in, on or at* to match the phrase in the table, or using *no preposition*. Each phrase could only be used once.

the sports centre

Example: I play basketball <u>at the sports centre</u> on Friday evenings.

100 degrees Celsius	cold weather	Fire	love	holiday	great speed

1. They fell _____ almost immediately and were married in a few weeks.
2. Water boils _____.
3. Matt likes to keep warm, so he doesn't go out much _____.
4. Look! That car is _____! Somebody call the fire brigade.
5. A: I am going _____ next week. B: Where are you going? Somewhere nice?
6. Technology has developed _____.
7. Franklin began working on the project _____ yesterday.

Booklet IV

I. Choose *in, on, at* or *no preposition* to fill in the blank. Each question has only one correct answer.

1. There was a long queue of people _____ the bus stop.
2. Lunch is _____ me.
3. Who was the first man _____ the moon?
4. I was sick, so I didn't go to work _____ last Thursday.
5. Will you be here _____ the weekend?
6. The dance was popular _____ the 1920s.
7. The earth travels round the sun _____ 107,000 kilometers an hour.
8. She called out to me _____ a loud voice.
9. Is your sister _____this photograph? I don't recognize her.
10. Do you work _____ Saturday evenings?

II. Complete the sentences, using *in, on or at* to match the phrase in the table, or using *no preposition*. Each phrase could only be used once.

the sports centre

Example: I play basketball <u>at the sports centre</u> on Friday evenings.

the world	the right	the way to work	the back of the class	the sky	the station

1. It was a lovely day. There wasn't a cloud _____.
2. I'll see you _____this evening.
3. In most countries people drive _____.
4. What is the tallest building _____.
5. I usually buy a newspaper _____ in the morning.
6. I couldn't hear the teacher last night. She spoke quietly and I was sitting _____.
7. My train arrives at 11.30. Can you meet me _____?

Booklet V

I. Choose *in, on, at* or *no preposition* to fill in the blank. Each question has only one correct answer.

1. I didn't hear the news _____ the radio.
2. I wouldn't like an office job. I couldn't spend the whole day sitting _____ a desk.
3. Can you skate backwards _____ one leg?
4. There's a train _____ 11.42.
5. Mary and David always go out for dinner _____ their wedding anniversary.
6. Look at those people swimming _____ the river.
7. The price of electricity is going up _____ October.
8. The chance of that happening is one _____ a million.
9. Call me _____ the day after tomorrow.
10. I had never seen so many people before. I was astonished _____ the crowds.

II. Complete the sentences, using *in, on or at* to match the phrase in the table, or using *no preposition*. Each phrase could only be used once.

the sports centre

Example: I play basketball <u>at the sports centre</u> on Friday evenings.

11 second	the moment	night	14 February	the middle Ages	New Year's Eve

1. (on the phone) "Can I speak to Dan?" "I'm afraid he's not here _____."
2. Ben is a very fast runner. He can run 100 meters _____.
3. She goes to supermarket _____every Sunday.
4. Many of Europe's great cathedrals were built _____.
5. If the sky is clear, you can see the stars _____.
6. I've been invited to a wedding _____.
7. There are usually a lot of parties _____.

Booklet VI

I. Choose *in, on, at* or *no preposition* to fill in the blank. Each question has only one correct answer.

1. They’re having fun_____ the beach.
2. I'd like to talk to you _____ private.
3. Emily and I arrived _____ the same time.
4. There is a violet _____ the vast.
5. There was an accident _____ the crossroads this morning.
6. The train service isn’t very good. The trains are rarely _____ time.
7. I should be there _____ half an hour.
8. The country was _____ war and life was difficult for everyone.
9. See you _____ tomorrow evening.
10. Sometimes I have problems at work, but _____ the whole I enjoy my job.

II. Complete the sentences, using *in, on or at* to match the phrase in the table, or using *no preposition*. Each phrase could only be used once.

the sports centre

Example: I play basketball <u>at the sports centre</u> on Friday evenings.

these flowers	the rain	block capitals	television	the phone	$12

1. Don’t go out _____. Wait until it stops.
2. Call me _____ the day after tomorrow.
3. I feel lazy this evening. Is there anything worth watching _____?
4. Please write your address clearly, preferably _____.
5. A: Is Sarah here? B: Yes, but she’s _____ at the moment. She won’t be long.
6. Tickets are now on sale _____.
7. Look_____. Aren’t they pretty?

Booklet VII

I. Choose *in, on, at* or *no preposition* to fill in the blank. Each question has only one correct answer.

1. If you come here by bus, get off _____ the stop after the traffic lights.
2. I haven't seen Kate for a few days. I last saw her _____ Tuesday.
3. I hope you succeed _____getting what you want.
4. I enjoyed the flight, but the food _____ the plane wasn't very nice.
5. We travelled overnight to Paris and arrived _____ 5 o'clock in the morning.
6. She came home_____ early.
7. Andy has gone away. He'll be back _____ a week.
8. I'm sorry. I didn't mean to annoy you. I didn't do it _____ purpose.
9. We noticed a crack _____ the wall.
10. I love watching the children _____ play.

II. Complete the sentences, using *in, on or at* to match the phrase in the table, or using *no preposition*. Each phrase could only be used once.

the sports centre

Example: I play basketball <u>at the sports centre</u> on Friday evenings.

your coffee	the island	the mountains	the computer	the next garage	that tree

1. There's something wrong with the car. We'd better stop _____.
2. Would you like sugar _____?
3. The leaves _____ are a beautiful color.
4. Last year we had a wonderful skiing holiday _____.
5. There's nobody living _____. It's uninhabited.
6. Thomas is sitting _____.
7. He left school_____ last June.

Booklet VIII

I. Choose *in, on, at* or *no preposition* to fill in the blank. Each question has only one correct answer.

1. Where is the car waiting? _____ the traffic lights.
2. She's writing the alphabet_____ the board.
3. The course begins _____ 6 January and end sometime in April.
4. At first we didn't get on very well, but _____the end we became good friends.
5. I look stupid with this haircut. Everybody will laugh _____ me.
6. The plane leaves _____ tomorrow morning.
7. The bird is _____ the cage.
8. The students had a party _____ the end of course.
9. I don't want to be dependent _____ anybody.
10. We got to the station just _____ time for our train.

II. Complete the sentences, using *in, on or at* to match the phrase in the table, or using *no preposition*. Each phrase could only be used once.

the sports centre

Example: I play basketball <u>at the sports centre</u> on Friday evenings.

end of September	Saturdays	1492	21 July 1969	the same time	the evening

1. Columbus made his first voyage from Europe to America _____.
2. I'll be moving to a new address _____.
3. After working hard during the day, I like to relax _____.
4. I'll see you _____ next Friday.
5. Neil Armstrong was the first man to walk on the moon _____.
6. It's difficult to listen if everyone is speaking _____.
7. Liz works from Monday to Friday. Sometimes she also works _____.

Booklet IX

I. Choose *in, on, at* or *no preposition* to fill in the blank. Each question has only one correct answer.

1. I saw Gary _____ his bike.
2. Where's the man standing? _____ the entrance.
3. We often have a short holiday _____ Christmas.
4. Have you ever been _____ love.
5. She had left his pen _____ his coat pocket.
6. The 11.45 train left _____ time.
7. “What does your sister do? Has she got a job? ” “No, she’s still _____ school.”
8. It was a short book and easy to read. I read it _____ a day.
9. She had left her light _____ and I went in to turn it off.
10. They got married _____ last March.

II. Complete the sentences, using *in, on or at* to match the phrase in the table, or using *no preposition*. Each phrase could only be used once.

the sports centre

Example: I play basketball <u>at the sports centre</u> on Friday evenings.

my watch	pencil	a tour	strike	120 miles an hour	my opinion

1. If you write _____ and make a mistake, you can rub it out and correct it.
2. I glanced _____to see what the time was.
3. Amanda thought the restaurant was OK, but _____ it wasn’t very good.
4. Soon after we arrived, we were taken _____ of the city.
5. She goes to supermarket _____every Sunday.
6. Workers at the factory have gone _____ for better pay and conditions.
7. The train was travelling _____.

Appendix B. Test materials for the main empirical study

Test A	Name:	School:

I. Choose *in*, *on*, *at* or *no preposition* to fill in the blank. Each question has only one correct answer.

1. I don't have your address. Could you write it _____ the back of this card?
2. I'll meet you _____ the hotel lobby.
3. The match starts _____ 3 o'clock.
4. I'll see you _____ Friday.
5. There is somebody _____ the door. May I go and see who it is?
6. They arrived _____ October.
7. His Ferrari crashed _____ 120 miles an hour.
8. I was ill, so I didn't go to work _____ last Thursday.
9. Emily and I arrived _____ the same time.
10. The dance was popular _____ the 1920s.
11. I didn't hear the news _____ the radio.
12. Mary and David always go out for dinner _____ Saturday evenings.
13. Many of Europe's great cathedrals were built _____ the Middle Ages.
14. They're having fun_____ the beach.
15. I'd like to talk to you _____ private.
16. There was an accident _____ the crossroads this morning.
17. The train service isn't very good. The trains are seldom _____ time.
18. The country was _____ war and life was difficult for everyone
19. Sometimes I have problems at work, but _____ the whole I enjoy my job.
20. If you come here by bus, get off _____ the stop after the traffic lights.
21. I hope you succeed _____getting what you want.

22. We noticed a crack _____ the wall.

23. The plane leaves _____ tomorrow morning.

24. The bird is _____ the cage.

25. I don't want to be live _____ anybody.

26. I saw Gary _____ his bike.

27. We often have a short holiday _____ Christmas.

28. Have you ever been _____ love?

29. “What does your sister do? Has she got a job? ” “No, she’s still _____ school.”

30. They got married _____ last March.

II. Complete the sentences, using *in, on or at* to match the phrase in the table, or using *no preposition*. Each phrase could only be used once.

100 degrees Celsius	few minutes	my opinion	the way to work	the world
the station	a tour	night	New Year’s Day	----

1. The train will be leaving_____.
2. Amanda thought the restaurant was OK, but _____ it wasn’t very good.
3. Water boils _____.
4. What is the tallest building _____.
5. I usually buy a newspaper _____ in the morning.
6. My train arrives at 11.30. Can you meet me _____?
7. She goes to supermarket _____every Sunday.
8. If the sky is clear, you can see the stars _____.
9. There are usually a lot of parties _____.
10. Soon after we arrived, we were taken _____ of the city.

Test B	Name:	School:

I. Choose *in*, *on*, *at* or *no preposition* to fill in the blank. Each question has only one correct answer.

1. One of the strings _____ my guitar is broken.
2. There is some water _____ the bottle.
3. I went to bed _____ midnight
4. I don't go out _____ Monday mornings.
5. Every morning Bob is _____the bus stop waiting for the bus.
6. I should be there _____ half an hour.
7. The earth travels round the sun _____ 107,000 kilometers an hour.
8. Franklin began working on the project _____ yesterday.
9. Mozart was already writing music _____ the age of five.
10. We got to the station just _____ time for our train.
11. What's _____ TV tonight?
12. I haven't seen Kate for a few days. I last saw her _____ Tuesday.
13. I'll see you _____ the morning.
14. I enjoyed the flight, but the food _____ the plane wasn't very nice.
15. We all sat _____ order.
16. I wouldn't like an office job. I couldn't spend the whole day sitting _____ a desk.
17. The 11.45 train left _____ time.
18. I love watching the children _____ play.
19. Lunch is _____ me.
20. The cats spend most of the day sitting _____ the window and looking outside.
21. The girls were all dressed _____white.
22. Look at those people swimming _____ the river.

23. She went _____ home.

24. Is your sister _____this photograph? I can't find her.

25. She had left her light _____ and I went in to turn it off.

26. She's writing the alphabet_____ the board.

27. We travelled overnight to Paris and arrived _____ 5 o'clock in the morning.

28. At first we didn't get on very well, but _____the end we became good friends.

29. I look stupid with this haircut. Everybody will laugh _____ me.

30. I'll see you _____ next Friday.

II. Complete the sentences, using *in, on or at* to match the phrase in the table, or using *no preposition*. Each phrase could only be used once.

my birthday	11 second	the moment	the mountains	the island
the computer	the rain	----	Television	$12

1. Ben is a very fast runner. He can run 100 meters _____.
2. Don't go out _____. Wait until it stops.
3. Tickets are now on sale _____.
4. There's nobody living _____.
5. Last year we had a wonderful skiing holiday _____.
6. Thomas is sitting _____.
7. I'll see you _____this evening.
8. (on the phone) "Can I speak to Dan?"

   "I'm afraid he's not here _____."
9. I've got a present _____.
10. I feel lazy this evening. Is there anything worth watching _____?

Test C	Name:	School:

I. Choose *in*, *on*, *at* or *no preposition* to fill in the blank. Each question has only one correct answer.

1. I like that picturing hanging _____ the wall in the kitchen.
2. He is very ill _____ bed. He can't go to school.
3. There's a train _____ 11.42.
4. Liz works from Monday to Friday. Sometimes she also works _____ Saturdays.
5. There was a lot of people _____ the corner.
6. They arrived _____ 1980.
7. Look _____ these flowers. Aren't they pretty?
8. Call me _____ the day after tomorrow.
9. Will you be here _____ the weekend?
10. Andy has gone away. He'll be back _____ a week.
11. I'm going _____ business next week.
12. The course begins _____ 6 January and end sometime in April.
13. It was a short book and easy to read. I read it _____ a day.
14. Who was the first man _____ the moon?
15. There are 1000 kilograms _____ a tone.
16. Where is the car waiting? _____ the traffic lights.
17. Be _____ time. Don't be late.
18. I'm really not very good _____ math.
19. She's _____ a diet.
20. Where's the man standing? _____ the entrance.
21. She called out to me _____ a loud voice.
22. There is a rose _____ the vast.

23. See you _____ tomorrow evening.

24. He had left his pen _____ his pocket.

25. I'm sorry. I didn't do it _____ purpose.

26. Can you skate _____ one leg?

27. The students had a party _____ the end of course.

28. The chance of that happening is one _____ a million.

29. I had never seen so many people before. I was astonished _____ the people.

30. She came home_____ last Friday.

II. Complete the sentences, using *in, on or at* to match the phrase in the table, or using *no preposition*. Each phrase could only be used once.

your coffee	holiday	cold weather	1968	the right
the next garage	my watch	21 July 1969	the same time	----

1. What was it like to be a student _____?
2. Matt likes to keep warm, so he doesn't go out much _____.
3. I glanced _____to see what the time was.
4. Would you like sugar _____?
5. In most countries people drive _____.
6. There's something wrong with the car. We'd better stop _____.
7. He left school_____ last June.
8. It's difficult to listen if everyone is speaking _____.
9. Neil Armstrong was the first man to walk on the moon _____.
10. A: I am going _____ next week. B: Where are you going? Somewhere nice?

Appendix C. Teaching materials for the traditional rote learning

Teaching materials for the control group: Lesson one

Part one: prelude (about 3 minutes)

Firstly, use interesting prologue to attract students. Secondly, show Figure1and then ask students to fill in the blank.

Figure1. Exercises for prelude

Thirdly, reveal the answer that *on* a plane, *in* his car and *at* the goalmouth. Tell students that today we will learn how to distinguish these prepositions: *in*, *on* and *at*.

Part two: explain the answers in picture 1 with each definition (5 minutes)

For the sentence *The man is flying ____ a plane*, we use preposition *on*. Because one definition of *on* is *supported by something*. Here, the man is supported by the plane.

For the sentence *The man is singing____ his car*, we use *in*, as one definition of *in* is that *within the shape of something or surrounded by something*. Here, the man is within the shape of his car, meanwhile, he is surrounded by the car.

For the sentence *Andy is standing____ the goalmouth*, we use *at*, for the definition that *used to say where something or somebody is*. Here, Andy is standing in the front of the goalmouth and we use *at* to express Andy's position.

Part three: teaching spatial usages of *in*, *on* and *at* (about 4 minutes for each preposition)

Teach preposition *in*

Ask students to read the definitions and examples by themselves (see Figure 2). If they have questions, they can ask the teacher to explain, such as vocabulary, phrases (about 2 minutes).

in	at a point within an area or a space	-The kids are playing in the street. -I read about it in the paper.
	within the shape of sth; surrounded by sth	-She is sitting in an armchair. -Leave the key in the lock.

Figure 2. The definition of *in*

Ask students to match every picture in Figure 3 with the definitions in Figure 2 and then make sentences based on these phrases (about 2 minutes).

Figure 3. The related pictures of preposition *in*

Firstly, show the sample of the five pictures in Figure 3 to students (*The mouse is in the purse*). Then ask the students which definition can support this sentence. The right definition is the second *within the shape of something; surrounded by something*. Secondly, following the same steps, ask students to explain the phrase by matched definition and then make sentences.

Table 1.

Key answers of the matching between phrase and definitions of in

The mouse is in the purse.	in Paris	in the bottle	in the newspaper	in the car
definition 2	definition 1	definition 2	definition 1	definition 1

Teach preposition *on*

Ask students to read the definitions and examples by themselves (see Figure 4). If they have questions, they can ask teacher to explain, such as vocabulary, phrases (about 2 minutes).

on	in or into a position covering, touching or forming part of a surface	-There is a picture on the wall. -Read the text on page 5.
	supported by sb or sth	-She is standing on one foot. -Hang your coat on that hook.
	at or near a place	-My house is on the Thames. -I like the town on the coast.

Figure 4. The definition of *on*

Ask students to match every picture in Figure 5 with the definitions in Figure 4 and then make sentences based on these phrases (about 2 minutes).

Figure 5. The related pictures of preposition *on*

Do the same procedure as teaching *in*, show the first picture to students and explain the sentence with the matched definition. Next in order, ask students to match the picture with right definition of on and then make sentences.

Table 2

Key answers of the matching between phrase and definitions of on

The mouse is doing a handstand on the box.	on the blackboard	on the plate	on the notice board	on the ceiling
definition 2	definition 1	definition 2	definition 1	definition 1

Teach preposition *at*

Ask students to read the definitions and examples by themselves in Figure 6. If they have questions, they can ask teacher to explain, such as vocabulary, phrases (about 2 minutes).

at	used to say where sth or sb is or where sth happens	-Does this train stop at Newport? -The cat is at the top of the table.
	used to say where sb works or studies	-She's at Yale(=Yale University). -He works at the bank.

Figure 6. The definition of *at*

Ask students to match every picture in Figure 6 with the definitions in Figure 4 and then make sentences based on these phrases (about 2 minutes).

Figure 7. The related pictures of preposition *at*

Do the same procedure as teaching *in*, show the first picture to students and explain the sentence with the matched definition. Next in order, ask students to match the picture with right definition of on and then make sentences.

Table 3.

Key answers of the matching between phrase and definitions of at

the mouse is sitting at the table	at home	at a party	at the door	at thedoctor
definition 1 or 2	definition 1	definition 1	definition 1	definition 1

Part four: homework

Let students finish the exercise of Appendix E: Class-exercise materials for lesson one by themselves. Students should be able to classify the definitions of every preposition.

Answers:

A. Gaps. 1. in, 2. in; on, 3. at, 4. on, 5. at, Order: 5-4-1-2-3

B. Multiple choices. 1. c, 2. b, 3.b, 4. a, 5. c, 6. a, 7. c, 8. c, 9. a, 10. b, 11. b, 12. a.

Teaching materials for the control group: Lesson two

Part one: teaching temporal usages of *in*, *on* and *at* (5 minutes for each preposition)

Teach preposition *in*

Ask students to read the definitions and examples by themselves (see Figure 1). If they have questions, they can ask the teacher to explain, such as vocabulary, phrases (about 2 minutes).

in	during a period of time	- in 2005 - in the 18th century - in spring / summer / autumn / winter - in March - in the morning / afternoon / evening
	after a particular length of time	- to return in a few minutes / hours / days / ... - She learnt to drive in three weeks.

Figure 1. The definition of *in*

Ask students to make sentences. First, using proper preposition to describe the picture in Figure 2 and then make sentences (about 3 minutes).

Figure 2. The related pictures of preposition *in*

Key answers of the matching between phrase and definitions of *in*: 1. It always snows in winter., 2. in spring, 3.in summer, 4.in autumn, 5.in the sky, 6.in 2008.

Teach preposition *on*

Ask students to read the definitions and examples by themselves (see Figure 3). If they have questions, they can ask the teacher to explain, such as vocabulary, phrases (about 2 minutes).

on	used to show a day or date	- He came on Sunday. - on the evening of May the first - on one occasion - on your birthday
	immediately after sth	- On arriving home I discovered they had gone. - Please report to reception on arrival.

Figure 3. The definition of *on*

Ask students to make sentences. Using proper preposition to describe the picture and then make sentences (about 3 minutes).

Figure 4. The related pictures of preposition *on*

Key answers of the matching between phrase and definitions of*on*:1.on Sunday(on Monday, on Tuesday…), 2.on the 25th of July, 3.on the boy's birthday, 4.on Christmas Day, 5. On New Year's Eve.

Teach preposition *at*

Ask students to read the definitions and examples by themselves (see Figure 5). If they have questions, they can ask the teacher to explain, such as vocabulary, phrases (about 2 minutes).

at	used to say when sth happens	- We left at 2 o'clock. - at the end of the week - At night you can see the stars
	used to state the age at which sb does sth	- He left school at the age of 16. - She got married at 25. ◇

Figure 5. The definition of *at*

Ask students to make sentences. Using proper preposition to describe the picture and then make sentences (about 3 minutes).

Figure 4. The related pictures of preposition *at*

Key answers of the matching between phrase and definitions of*at*:1. at 2:55, 2. at midday, 3.at night, 4.at Christmas, 5. at the age of 2, 6.at weekend.

Part three: homework

Let students finish the exercise of Appendix E: Class-exercise materials for lesson two by themselves. Students should be able to classify the definitions of every preposition.

Answers:

A. Choose the correct option: 1. in, 2. at, 3. in; at, 4. at, 5. no preposition, 6. on, 7. on, 8. no preposition, 9. in, 10. on

B. Match the halves to make sentences\questions complete: 1. d or h, 2. h or d, 3. f, 4. e, 5.a, 6. g, 7. b, 8. c

Teaching materials for the control group: Lesson three

Part one: teaching other usages of *in*, *on* and *at*

Teach preposition *in*

Ask students to read the definitions and examples by themselves (see Figure 1). If they have questions, they can ask the teacher to explain, such as vocabulary, phrases (about 4 minutes). Teachers could provide assistances for students to understand the abstract definitions.

in	forming the whole or part of sth/sb; contained within sth/sb	-There are 31 days in May. -I recognize his father in him.
	used to show a state or condition	-The house is in good repair. -Are you interested in art? --Do you believe in God? -I hope you succeed in finding the job you want.

Figure 1. The definition of *in*

Teach preposition *on*

Ask students to read the definitions and examples by themselves (see Figure 2). If they have questions, they can ask the teacher to explain, such as vocabulary, phrases (about 7 minutes). Teachers could provide assistances for students to understand the abstract definitions.

on	used to show a means of transport	-He was on the plane from Bonn. -I came on my bike.
	about sth/ ab	-I have a book on South Africa.
	being carried by sb; in the possession of sb	-Have you got any money on you?
	used to show that sb belongs to a group or an organization	-to be on the committee/ stuff/ jury/ panel -Whose side are you on?
	eating or drinking sth; using a drug regularly	-he lives on a diet of junk food. -The doctor put me on antibiotics.
	used to show direction	-Andy is sitting on the left.
	used to describe an activity or a state	-to be on holiday/ business/ -You can depend on Jill.
	used to show the basis or reason for sth	-a story based on fact
	paid for by sth	-to live on a pension/ a low wage

Figure 2. The definition of *on*

Teach preposition *at*

Ask students to read the definitions and examples by themselves (see Figure 3). If they have questions, they can ask the teacher to explain, such as vocabulary, phrases. It takes about 4 minutes. Teachers could provide assistances for students to understand the abstract definitions.

at	in the direction of or towards sb/ sth	-What are you looking at? - Don't point that knife at me. - He shouts at her because he is angry.
	used with adjectives to show how well sb does sth	-I'm good at French. -I am bad at repairing things.
	used with adjectives to show the cause of sth	-She is delighted at the result. -They are impatient at the delay.
	used to show the situation sb/sth is in, what sb is doing or what is happening	-The country is at war. -I feel at disadvantage.
	used to show a rate, speed, etc	-He was driving at 70 mph. -The noise came at two-minute intervals.

Figure 3. The definition of *at*

Part two: class-exercise

Let students finish the exercise of Appendix E: Class-exercise materials for lesson three by themselves. Students should be able to classify the definitions of every preposition.

Answers:

A. Fill in the blank with correct preposition: 1. in, 2. on; at, 3. at, 4. in, 5. on

B. Fill in the blank with correct preposition: 1. at, 2. at, 3. in, 4. on, 5. in, 6. on

Appendix D. Teaching materials for the CL-inspired meaningful learning

Teaching materials for the experimental group: Lesson one

Part one: prelude (about 3 minutes)

Firstly, use interesting prologue to attract students. Secondly, show the picture in Figure 1and then ask students to fill in the blank.

Figure1. Exercises for prelude

Reveal the answer that *on* a plane, *in* his car and *at* the goalmouth. Tell students that today we will learn a shortcut for dealing with prepositions.

Part two: explain the answers in Figure 1 with general introduction of *in*, *on* and *at* (5 minutes)

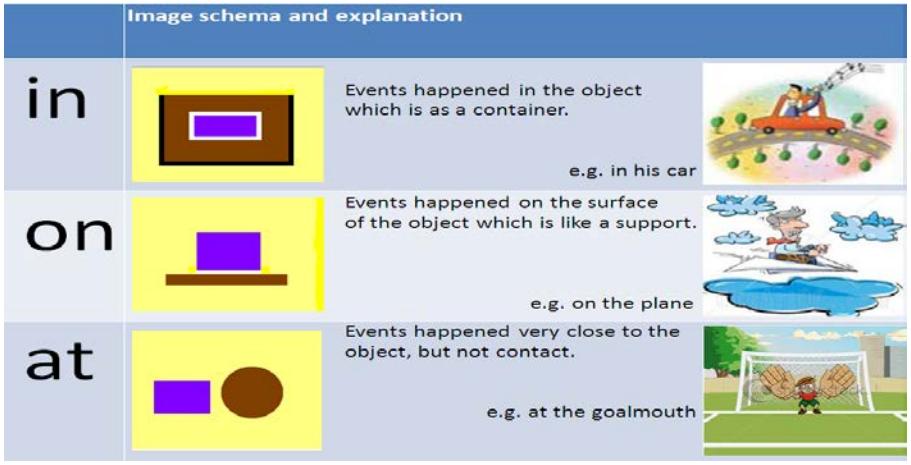


Figure2.The general understanding of *in*, *on* and *at*

Referring to *in*, the image schema of it is CONTAINMENT. Events happened within the object. And we use the image that the purple express the event, so-called the trajector(the TR) and the brown space is the landmark (the LM). Like the example *The man is singing in his car*, the car is a container and the man is inside.

Referring to *on*, the image schema is the basis of support that the event (the TR) happened on the surface of the object (the LM) and denotes the CONTACT. For example, in the sentence *The man is flying on the plane*, the plane supports the man and they contact to each other.

Referring to *at*, the image schema is that the event (the TR) happened very close to an object and compared with the background, the object where the event happened can be regarded as a point concept (the LM). Such as, in the sentence *Andy is standing at the goalmouth*, *Andy* now is not contact with the goalmouth, just very close to it. Meanwhile, comparing with the football field, the place Andy standing can be regarded as a point.

Part three: teaching spatial usages of *in*, *on* and *at* (each preposition 4 minutes)

Teach preposition in

Teacher should explain the first two sentences and let students analyse the third sentence (see Figure 3).

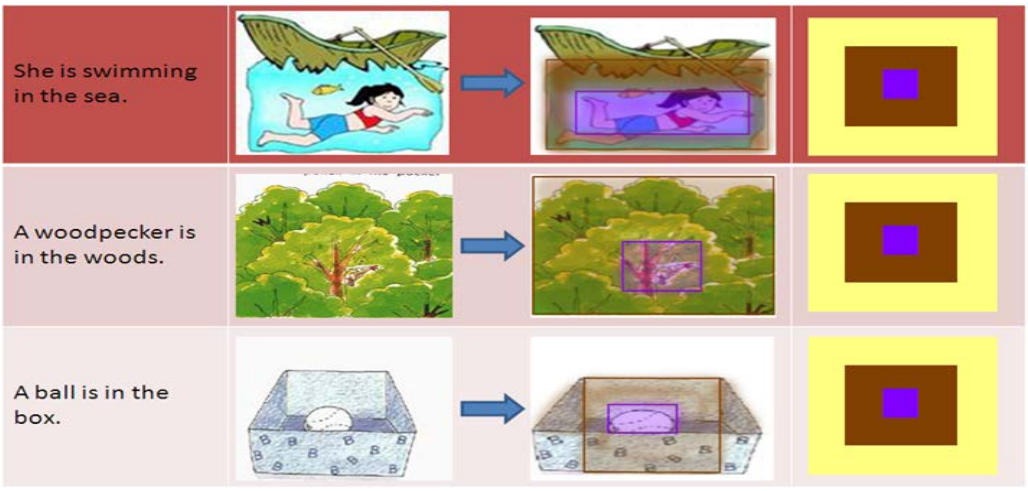


*Figure3.*The examples of *in* and how the CONTAINMENT schema is applied

In sample one, *She is swimming in the sea*, what is the sea look like? It is a container. And the girl is swimming within the area and surrounded by the sea. So we can illustrate in this concrete way and further this abstract way. Next in order, sample two, *A woodpecker is in the woods*, the woods are like a container and the woodpecker is inside.

Try this sentence by yourself: *A ball is in the box*. What is the container? The box. Which object should be described in this sentence? Ball. Where is the ball? Just the same as we mentioned before, the ball is in the container and the box is that container.

In short, the abstract image in the right line can express the situation of *in*. Try to remember it and use your imagination to associate it with every possible sentence.

Teach preposition *on*

Explain the first two sentences and let students analyse the third sentence (see Figure 4).

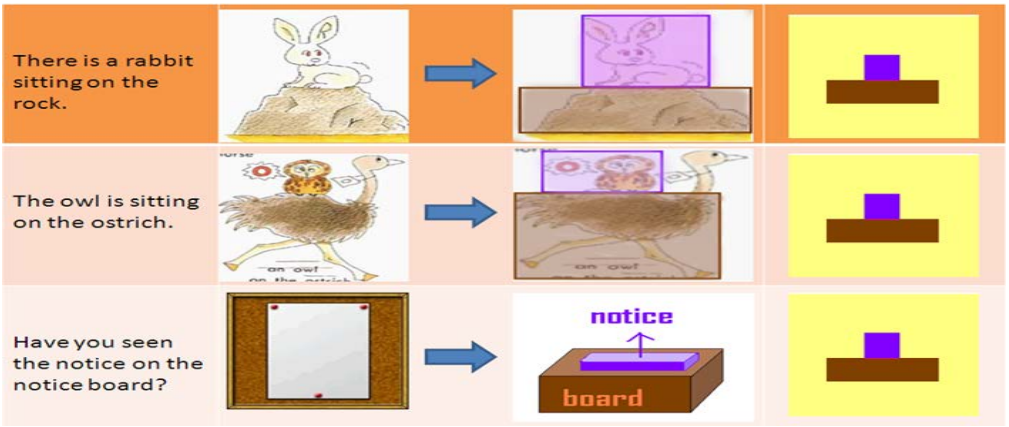


*Figure4.*The examples of *on* and how the CONTACT schema is applied

What kind of relationship can be expressed by *on*? The image schema of *on* is the basis of support that means something is on the surface of the object and denotes the contact.

In the first sample is *There is a rabbit sitting on the rock*, the rock support the rabbit and they contact. Rabbit is the object (the TR) and rock (the LM) is the supporter. They contact to each other. In the second sample, *the owl* (the TR) is supported by *the ostrich* (the LM) and they contact to each other.

The situation is the same as the third one. Would you like to analyse by yourself? What is the support (the LM)? *The notice board*. What is the event (the TR)? *The notice*. Thus, where is the notice? *On the notice board*. The notice board supports the notice and they are in contact.

Teach preposition *at*

Explain the first two sentences and let students do the third one (see Figure 5).

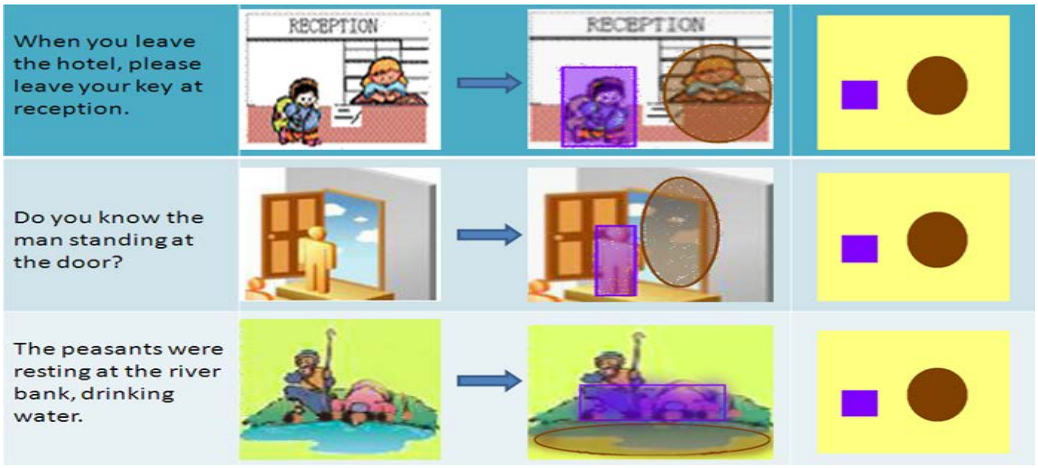


*Figure5.*The examples of *at* and how ADJACENCY schema is applied

In this sentence *When you leave the hotel, please leave your key at reception, the reception* is the object (the TR) and *you* is close to the reception but not contact with the reception. Meanwhile, comparing with the hotel, reception can be regarded as a point.

In the second example, *do you know the man standing at the door?* here, the door is the object (the TR) and the man is close to the door (the LM), not touch. Comparing with the house, where the man is standing can be regarded as a point.

Try the third one by yourself. *The peasants who are drinking water* is the event (the TR) and the river bank is the object (the LM). Compared with the whole river bank, the peasants just stand at a point of it. So we can use preposition *at* and the abstract image schema to express.

Part four: homework

Let students finish the exercise of Appendix E: Class-exercise materials for lessonone by themselves. Try to associate every situation with these three abstract image schemas and distinguish the similarity of each preposition.

Answers:

A. Gaps: 1. in, 2. in; on, 3. at, 4. on, 5. at The order of the pictures: 5-4-1-2-3

B. Multiple choices: 1. c, 2. b, 3. b, 4. a, 5. c, 6. a, 7. c, 8. c, 9. a, 10. b, 11. b, 12. a.

Teaching text for experimental group- Lesson two

Part one: review (about 5 minutes)

Remind the image schema of *in*, *on* and *at* (see Figure 1) and interpret the image schema's application for temporal usages.

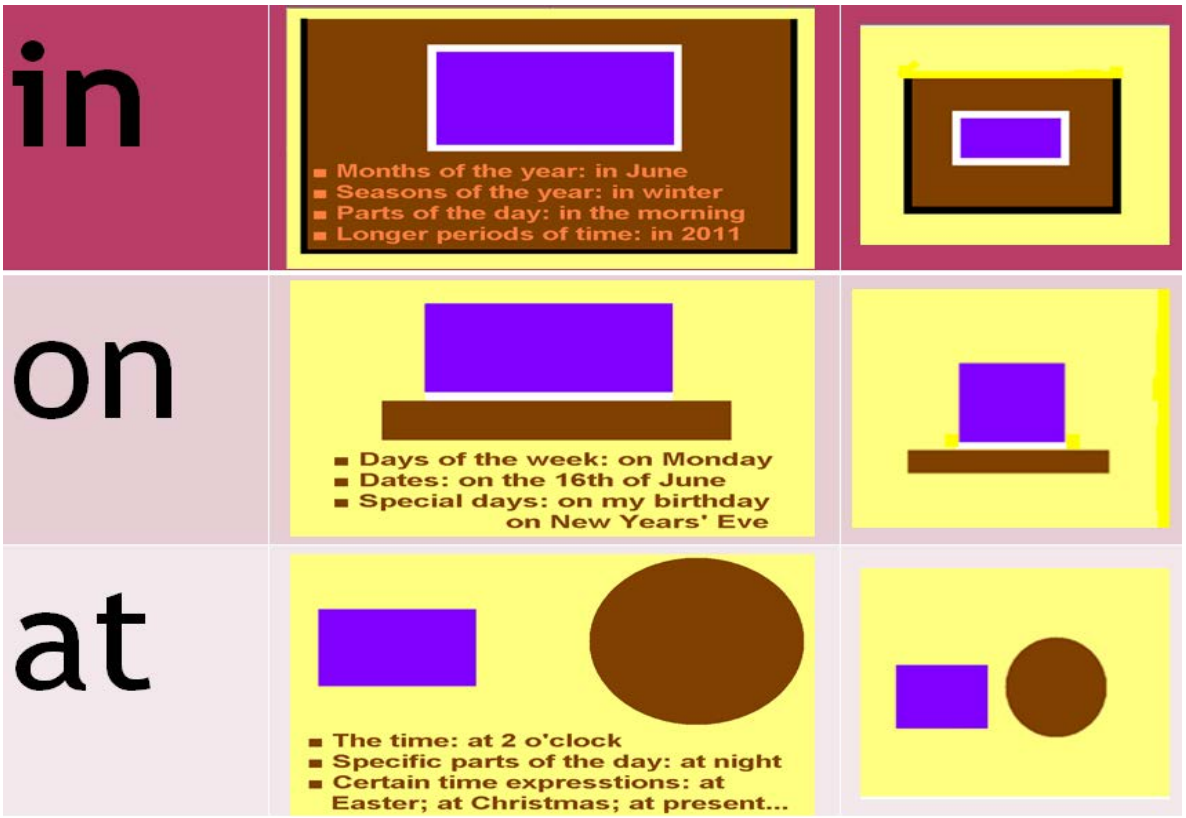


Figure 1. The image schema of *in*, *on* and *at* and the transfer of them in the temporal usages

The concept of CONTAINMENT, for instance, established by the spatial meaning of *in*, initially describes a spatial dimension, but can also be extended to a temporal dimension. In temporal domain, months of the year, seasons of the year, parts of the day and longer periods of time can be regarded as container. *On* and *at* can also transfer like this and the temporal definition for support and point concept are showed in Figure 1.

Part two: teaching temporal prepositions (5 minutes for each preposition)

Teach preposition *in*

Explain the first and the third sentences, and let students do the second one (examples see Figure 2).

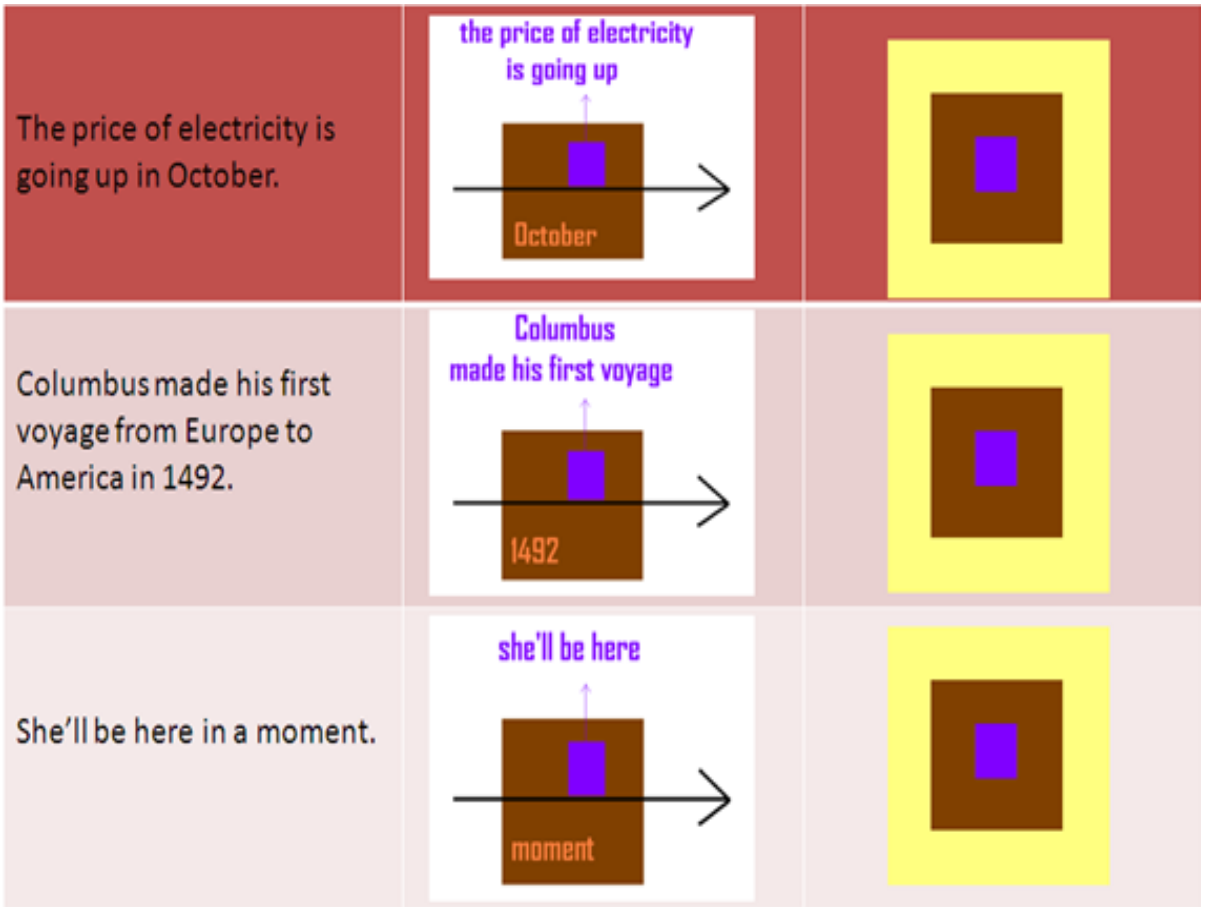


Figure 2. The image schema of *in* and the its application in the temporal usages

In the sentence, *The price of electricity is going up in October*, the month *October* is a container that can contain every day of this month. The event (the TR) *the price of electricity is going up* just happen within this container. So we can use the same image to express it as we talked about in lesson one.

Now, please analyse the second example by yourself. The year *1492*(the LM) is the container in the sentence, and the event (the TR) *Columbus made his first voyage* happened in some days of the whole year. We can also the first abstract image to express the meaning of the sentence and then use the image schema to express this kind of events.

Let's come to *She'll be here in a moment* together. *Moment* is the duration of time, and it can be consisted by many minutes. And the event (the TR) *she'll be here* just happened in this duration, so *a moment* here can be regarded as a container. Pay attention that "the

moment" here refers in particular to the duration, and it must happen in the future for the event (the TR) *she'll be here*. As we don't know how long will she be here, *the moment* is regarded as longer periods of time and matching with future tense which indicates a final status of *she'll be here*, *the moment* is regarded as a container and we use *in* the describe this time relation.

Normally, we use *in* as a container to express longer periods of time that is longer than one day and the time is always static to indicate a final status.

Teach preposition *on*

Explain the first two sentences and let students do the third one themselves (see Figure 3).

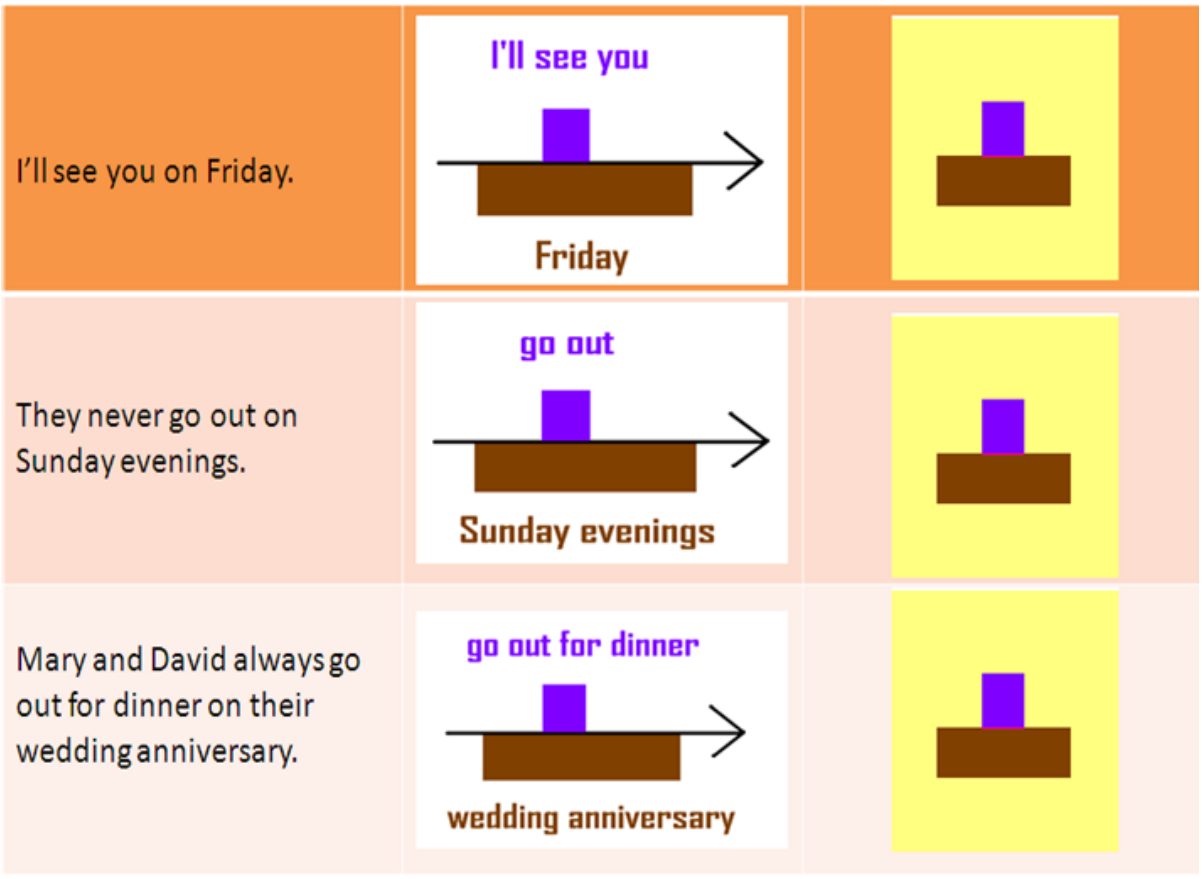


Figure 3. The CONTACT schema of *on* and the its application in the temporal usages

First come to the sentence *I'll see you on Friday*. The *Friday* is a day that is as long as one day, so we can't use *in* to describe it. The event (the TR) *I'll see you* is continuous, so the

Friday here is like a conveyor belt (the LM) to support the event (the TR)*I'll see you*. As we showed the meaning diagram, the same image schema can be used as the CONTACT in lesson one.

Look at the example *They never go out on Sunday evenings*. *Every Sunday's evening* is no longer a container anymore. Actually, we focus on the day concept of every evening, morning in a certain day which cannot be regarded as container but the basis of support and contact relation. So, in this sentence including *Sunday evenings*, we should pay more attention on *Sunday* rather than *evenings* and *Sunday evenings* is the support for the event (the TR) that *they never go out*. Especially, the event (the TR) *go out* is moving on the conveyor belt *Sunday evenings* (the LM) dynamically.

Try the third sentence by yourself. *Wedding anniversary* is a special day like Friday and Sunday evenings. And it is the support for the event (the TR) *Mary and David always go out for dinner*. And the celebration on the wedding anniversary can last a whole day.

Normally, we use *on* as one support to express a special day that prop up a continuous event.

Teach preposition *at*

Explain the all the sentences in Figure 4.

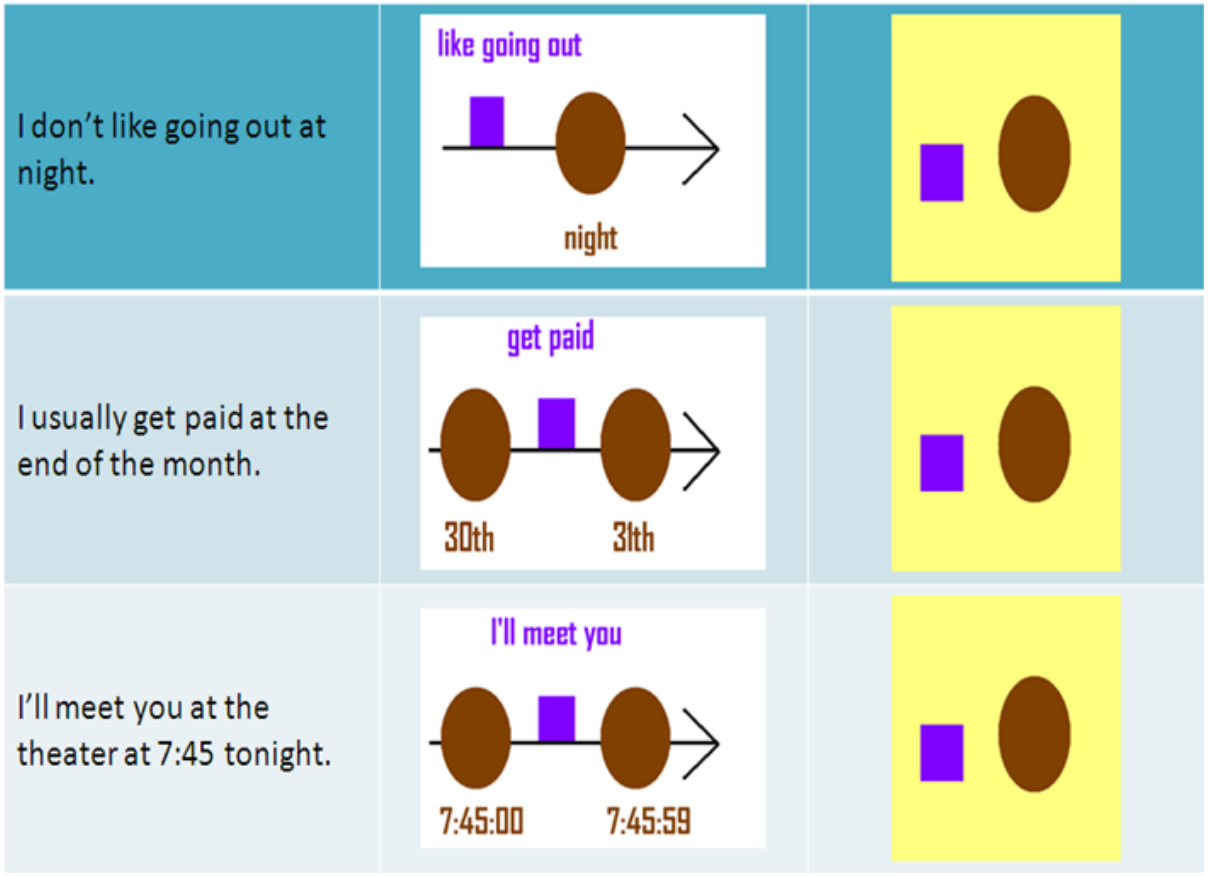


Figure 4. The image schema of *at* and the its application in the temporal usages

In the sentence *I don't like going out at night*, no one exactly knows when would *night* start generally, because the sunset is different every day and everyone has different definition. So *I don't like going out* can only happen very close to *night* in general, and compared with one day, *night* can be regarded as a point concept. So, we use *at* to describe the temporal concept night.

The second sentence is *I usually get paid at the end of the month*. *The end of the month* depends on which month it is. It's always changing as *night* and *I usually get paid* just close to this point concept, maybe 30th of the month or maybe 31th. So, we use *at* to describe the phrase.

7:45 looks very exactly, but one minute can divide into 60 seconds, and in which second is not fixed. Compared with the duration and longer time, such as year, day, *7:45* can be definitely regarded as a time point. Thus, *I'll meet you* happened at the point concept *7:45*, and we choose the preposition *at*.

Normally, we use *at* as close to a point concept to express time point and the time is always refer to something in general.

Part three: homework

Let students finish the exercise of Appendix E: Class-exercise materials for lesson two by themselves. Try to associate every situation with these three abstract image schemas and distinguish the similarity of each preposition.

Answers:

A. Choose the correct option: 1. in, 2. at, 3. in; at, 4. at, 5. no preposition, 6. on, 7. on, 8. no preposition, 9. in, 10. on

B. Match the halves to make sentences\questions complete: 1. d or h, 2. h or d, 3. f, 4. e, 5. a, 6. g, 7. b, 8. c

Teaching materials for the experimental group: Lesson three

Part one: review (2 minutes)

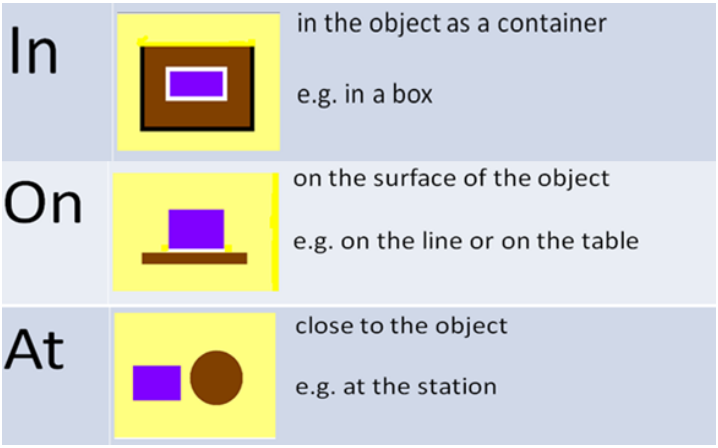


Figure 1. The image schemas of *in*, *on* and *at* as a reminder

Referring to *in*, the image schema of it is CONTAINMENT. Events (the TR) happen in the object (the LM). Referring to *on*, the image schema is CONTRACT which means the basis of support that something is on the surface of the object and denotes CONTACT. Referring to *at*, the image schema of it is ADJECENCY that the event (the TR) is very close to an object (the LM) and compared with the object, the place where the event happened can be regarded as a point concept.

The image schemas can not only refer to the spatial usages and the temporal usages, but also the abstract usages.

Part two: teaching abstract prepositions (6 minutes to each preposition)

Teach preposition *in*

Explain the first two sentences and let students associate the image schema of *in* with the third sentence (see Figure 2).

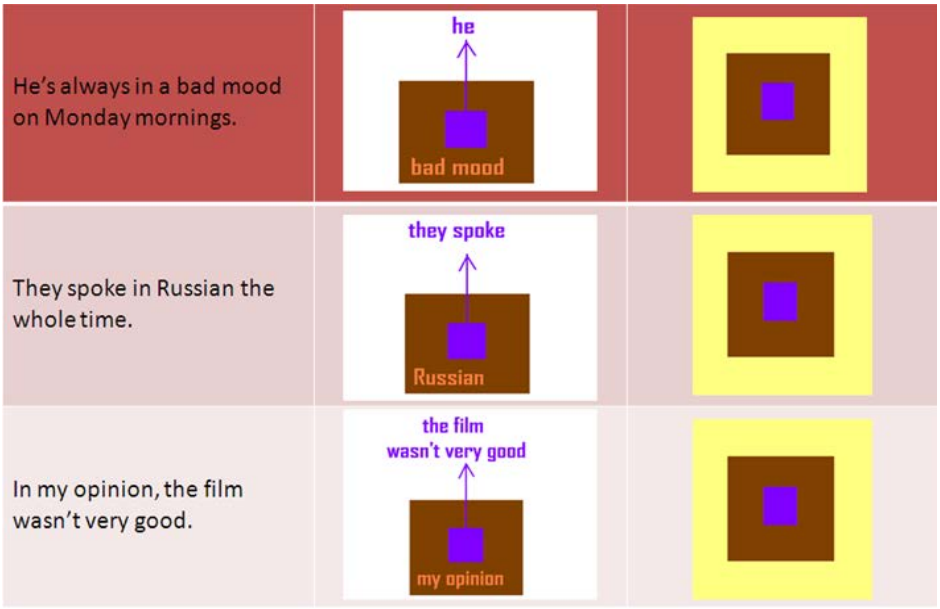


Figure 2. The image schema of *in* and the its application in the abstract usages

In the sentence, *He's always in a bad mood on Monday mornings*, what is bad mood?


Just like this picture, *the bad mood* envelops *he* and the situation can be regarded as containment. So, we use *in* to express the enclosure relationship.

It can be applied similarly in the second example. *Russian* is a kind of language, and when *they spoke* this language, they were involved in the container. So *Russian* (the LM) here is considered as the container, the event (the TR) just happened involved and the containment relationship we use *in* to express.

Try to interpret the third sentence with CONTAINMENT schema by yourself. What is the event (the TR)? *The film wasn't very good*. Where is come from? It is concluded in the container (the LM) *my opinion*. Which preposition should be used to describe this container relationship? Preposition *in*.

In all the three lessons, we can find out that with the concept of CONTAINMENT, the image schema of *in* can be applied for the spatial usages (in the spatial domain), the temporal usages (in the temporal domain) and the abstract usages (in the abstract domain).

Teach the preposition *on*

Explain the first and the third sentences and let students practice the second in Figure 3.

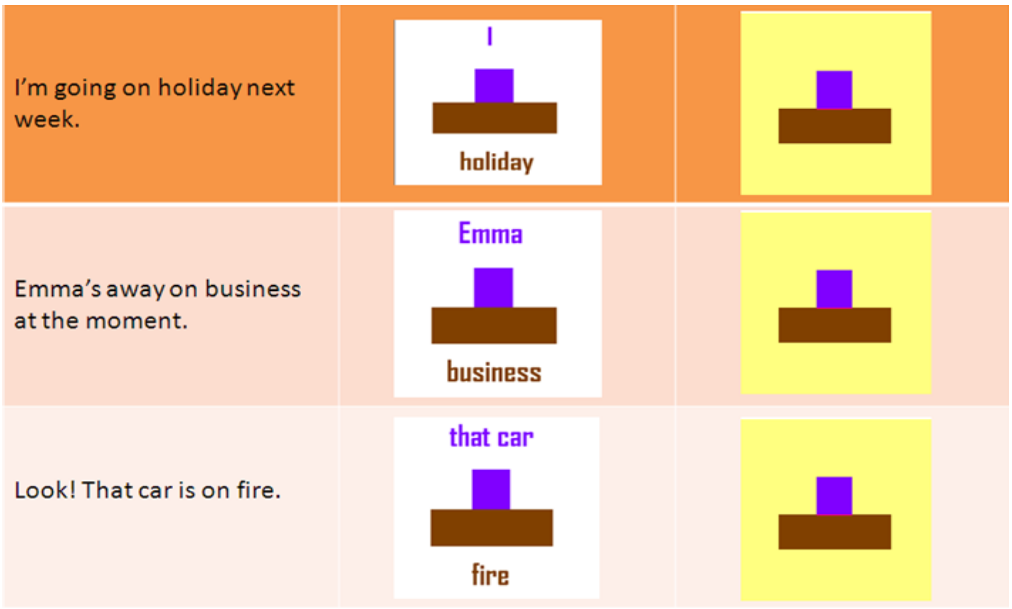


Figure 3. The image schema of *on* and the its application in the abstract usages

Holiday in the sentence *I'm going on holiday next week*, can be regarded as a conveyor belt which can support *I*. *I* is closely connected with *holiday*, because it's my *holiday*. To illustrate the contact and support relation, we use the same image schema CONTACT as the spatial usages and the temporal usages to describe this abstract situation.

You can try the second example by yourselves. What is the support in the sentence *Emma's away on business*? *Business*. And what is the event (the TR)? *Emma's away*. Thus, *business* is the basis of support for *Emma* and they connected to each other very closely. To describe the contact relation, we should use the preposition *on*.

Let's come to the third sentence *The car is on fire* together. Maybe some students could use *in* to express this situation that the fire encircled the car. But we emphasize that the preposition *on* focuses the close contact relation. This situation is the same as the spatial usages that the pan is on the fire. The fire supports the pan and they must contact closely.

Here is the same, *on fire* is used to describe a state as abstract usages and the contact relation can be illustrated by preposition *on*.

To sum up, the image schema CONTACT of *on* can also be used to express abstract usages.

Teach preposition *at*

Explain all the sentences related to *at* in Figure 4.

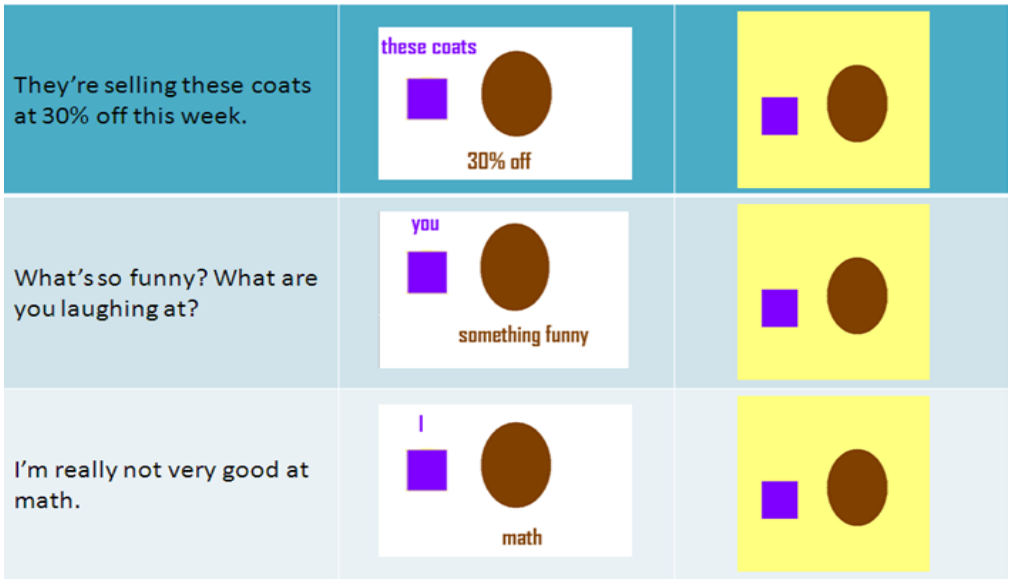


Figure 4. The image schema of *at* and the its application in the abstract usages

In the sentence *They're selling these coats at 30% off this week*, the price they selling the coats is not an exact number because each coat has its own price and 30% of the price is not certain. So, the price of these coats is close to the price of 30% off. And we illustrated in the interim picture and image schema on the left. Normally, we consider a number, such as price, scores and temperature degrees, as a concept of points.

In the sentence *what are you laughing at*, the end of extended line could be the things funny that you are laughing at. So, something funny just closed to you but not contacted with you. And in our experience, we know that the nearer is bigger and the further is smaller. So, at the end of extended line, something funny could be very small as a point. Thus, we use *at*to express this situation.

For the third sentence, *math* could include all kinds of knowledge, from the easier as *1+1=2*to the most difficult why 1+1 equals to 2. And what *I'm really not very good* could just be a little point within the math, so we use *at* to describe this *point* knowledge within any subject.

Part three: class-exercise

Let students finish the exercise of Appendix E: Class-exercise materials for lesson three by themselves. Try to imagine every situation with these three abstract image schemas and distinguish the similarity of each preposition.

Answers:

A. Fill in the blank with correct preposition: 1. in, 2. on; at, 3. at, 4. in, 5. on

B. Fill in the blank with correct preposition: 1. at, 2. at, 3. in, 4. on, 5. in, 6. on

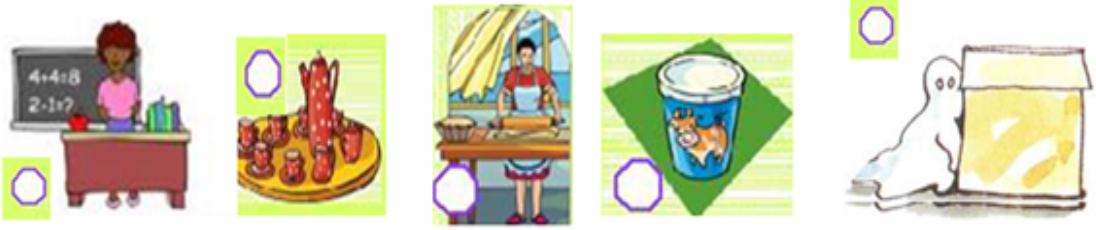
Appendix E. Class-exercise materials for the traditional rote learning and the CL-inspired meaningful learning

Class-exercise materials for lesson one

A. Gaps.

Match the sentences to the pictures and then use “in”, “on” or “at” to fill in the gaps.

1. Mother is ____the kitchen making a cake.
2. The milk is ____a paper cup with the drawing of a cow ____it.
3. The ghost is standing ____the box.
4. The teapot and the cups are ____ the table.
5. The teacher is teaching ____the table.



B. Multiple choices.
Choose the right preposition that goes with the sentence.







1.The dog is _____my feet.
a. in b. on c. at

2. Pencils are _____ the notebook.
a. in b. on c. at

3. The boy is playing ____ the chair.
a. in b. on c. at

4. The dog is _____ the basket.
a. in b. on c. at

5. The boy is sitting _____the computer.
a. in b. on c. at

6. He is _____ the gym.
a. in b. on c. at

7. I like to meet you _____ the airport.
a. in b. on c. at

8. _____ the end of the street, there is a path leading to the river.
a. in b. on c. at

9. I don't like cities. I like to live _____ the country.
a. in b. on c. at

10. There is a notice _____ the door. It says" Do not Disturb".
a. in b. on c. at

11. They live _____ Carlisle Street.
a. in b. on c. at

12. We spent a few days _____ New York.
a. in b. on c. at

Class-exercise materials for lesson two

A. Choose the correct option

1. John is going to Paris at/ on/ in May.
2. What time does it finish? AT/ On/ In 9:30.
3. There are lots of buses at/Ø/in the evening, but not at/on/in night.
4. Children are always so happy at/on/in Christmas.
5. I go out at/on/Ø every Friday night.
6. They will arrive at/on/in Sunday night.
7. My birthday is at/on/in June 22nd.
8. "Bye-bye Ann! See you Ø/on/in this evening. "
9. I'm going to Algarve at/on/in winter.
10. He's coming home at/on/in Wednesday.

B. Match the halves to make complete sentences/ questions.

1. What are you doing next ☐ a) Sunday mornings?
2. Do you go on holiday at ☐ b) February 25th.
3. She can't talk to you at ☐ c) the morning.
4. I see my parents every ☐ d) weekend?
5. What do you usually do on ☐ e) weekend.
6. Sue married in ☐ f) the moment. She's out.
7. The letter is posted on ☐ g) 1992.
8. We have classes in ☐ h) Easter?

Class-exercise materials for lesson three

A. Fill in the blank with correct preposition

1. Their lives are ____ danger.

2. We don't go ____ holiday. We stay ____ home.

3. Everybody is surprised ____ the news.

4. Write the story ____ your own words.

5. Do you spend much money ____ clothes?

B. Fill in the blank with correct preposition

He is looking____the clock because he wants to go home.	Fred takes his jacket and smiles ____me.	The boss is not interested ____ his plan.

Dave has no money left. He doesn't remember what he spent it ____.	The salesman succeeded____ selling all the phones.	Linda is talking ____the phone.

Declaration

I declare that, to the best of my knowledge, the research described herein is original except where the work of others is indicated and acknowledged, and that the thesis has not, in whole or in part, been submitted for any other degree at this or any other university.

_____

Xin Song

Landau

13. 06. 2013

Curriculum Vitae

Miss Xin Song, M.A., born on 17.01.1983 in Dalian, Liaoning, China.

Education Experience

9/1995-7/1998	Dalian No.15 Middle School, Dalian, Liaoning Province, China
9/1998-7/2001	Dalian No.20 Senior Middle School, Dalian, Liaoning Province, China
9/2001-7/2005	Bachelor of English Department in Dalian University, Dalian, Liaoning Province, China, majored in English and Modern Information Technology, topic of the thesis: Oscar Wilde and His aestheticism
9/2006-7/2009	Master of Foreign Language Institute in Fujian Normal University, Fuzhou, Fujian Province, China, majored in Foreign Linguistics and Applied Linguistics, topic of the thesis: Learning of Letter Names and Sounds and Their Contribution to Early Literacy - Evidence from English Learners of Native Chinese

Work Experience

9/2007- 6/2008	Fujian Communications Technology College, part-time English teacher, teaching Experiencing English
9/2007-1/2008	Fujian Policemen College, part-time English teacher, teaching New Horizon English
1/2008- 6/2009	Fujian Normal University, part-time English teacher, teaching Self-taught Examination English and Basic English Course
9/2009- 3/2010	Dalian Translation and Interpretation College, full-time teacher, teaching public English
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