Applying Cognitive Linguistics to Learning the Semantics of English *to, for* and *at*: An Experimental Investigation

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Abstract

Recent years have witnessed growing interest in cognitive linguistics (CL) and its potential insights for L2 learning. However, few experimental investigations have applied a CL perspective to instructed L2 learning. English prepositions represent a promising target for the application of CL to instructed L2 learning since, contrary to traditional approaches, CL represents the many meanings associated with a single preposition as being systematically related in principled ways. This article lays out the fundamentals of a CL analysis of the semantics of English prepositions and reports on a quasi-experimental study examining the efficacy of applying a CL approach to instructed L2 learning of the semantics of English *to, for* and *at*. Comparison of pre- and post-test results show significant gain scores ($p > .0003$), indicating that the group of 14 advanced learners who received instruction based on a CL perspective experienced substantial improvement in their understanding of the semantics of the three prepositions.

Keywords: applied cognitive linguistics, instructed second language learning, prepositions, English prepositions, semantics

Resumen

En los años recientes se ha visto un interés creciente por la lingüística cognitiva (CL) y en sus aportaciones en la docencia de L2. Sin embargo, existen pocos estudios aplicados de la perspectiva de CL al aprendizaje formal de una L2. Las preposiciones inglesas constituyen un área prometedora para la aplicación de la CL en el aprendizaje formal de L2 ya que, al contrario de los acercamientos tradicionales, la CL representa

los muchos significados asociados con una sola preposición como relacionados sistemáticamente de un modo ordenado. En este artículo presentamos los fundamentos de un análisis que usa la CL de la semántica de algunas preposiciones inglesas y un estudio semi-experimental que examina la eficacia de la aplicación de la CL al aprendizaje de la semántica de las preposiciones inglesas *to, for* y *at*. La comparación de los resultados de un *pre-test* y un *post-test* demuestran una mejora significativa ((p >.0003), lo que indica que el grupo de 14 alumnos/as que recibieron docencia basada en CL mejoraron su comprensión de la semántica de estas tres preposiciones.

Palabras clave: lingüística cognitiva aplicada, aprendizaje formal de una segunda lengua, preposiciones, preposiciones en inglés, semántica

1. Introduction

Language teachers and researchers have long recognized that the acquisition of prepositions poses major challenges for second language learners (e.g., Celce-Murcia and Larsen-Freeman, 1999). One reason for this is that the semantics of prepositions are notoriously difficult to characterize. For instance, on first inspection, the distinction between prepositions such as *over* and *above* is quite unclear. On one hand, the sentence: *The picture is over the mantle*, is a near paraphrase of: *The picture is above the mantle*. On the other hand, the sentence: *Mary hung her jacket over the back of the chair* is interpreted as meaning something quite different than: *Mary hung her jacket above the back of the chair.* Additionally, prepositions tend to develop a complex set of extended meanings, for instance, *over* has developed at least 16 meanings, many of which do not appear to be systematically related. Although linguists have long been aware that prepositions develop complex polysemy networks, the meaning networks surrounding spatial markers (and the systematic processes of meaning extension from which they result) have only become the foci of linguistic inquiry in the last 20 years. Even the best descriptive grammars and dictionaries present the multiple meanings of spatial language as largely arbitrary. Traditional accounts have represented the semantics of English prepositions as arbitrary (Bloomfield, 1933; Frank, 1972; Chomsky, 1995). Consequently, pedagogical treatments have often suggested memorization as the best strategy. Studies show that accurate use of spatial language is one of the last elements learned and many highly proficient L2 speakers never attain native speaker-like use (e.g., Lam, 2009). Indeed, Lam found that L2 Spanish learners made virtually no gains in their mastery of the prepositions *por* and *para* over the course of four years of college Spanish.

Cognitive Linguistics (CL) offers an alternative perspective, suggesting that the many distinct meanings associated with a particular preposition are related in

systematic, principled ways (e.g., Brugman, 1988; Dewell, 1994; Dirven, 1993; Lakoff, 1987; Linder, 1982; Hawkins, 1988; Herskovits, 1986, 1988; Tyler and Evans, 2001a, 2003; Vandeloise, 1991, 1994).

An important objective of this paper is to begin to explore the utility of an approach to English prepositions that takes seriously the perspective and methodology of CL (Evans and Tyler 2004a, 2004b; Tyler and Evans 2001a, 2003). This paper presents a quasi-experimental study of 14 very advanced English learners, who were professional translators whose native language is Italian. Even though these L2 learners had all studied English for more than 10 years and translated English on a regular basis, they continued to experience difficulty with the semantics of the English prepositions *to, for* and *at*. The results of a CL-based instructional intervention show these advanced learners were able to make significant progress on their accurate interpretation and use of these targeted prepositions ($p = .0003$).

The paper is organized as follows. We begin with an overview of the principles of CL which are central to the analysis of the semantics of English prepositions. This is followed by a CL-based analysis of the semantics of English *to* and *at*. Next the quasi-experimental study is presented, followed by a discussion. We end with a few remarks about limitations and future directions for experimental work on the efficacy of using a CL-based approach for instruction on the semantics of English prepositions.

2. Basics of Cognitive Linguistics and the semantics of English prepositions

2.1. Overview

Theoretical advances in CL and the semantics of spatial language (e.g. Lakoff, 1987; Tyler & Evans, 2003) have provided important insights which demonstrate that much of what has been taken as arbitrary is far more systematic than previously thought. These theoretical breakthroughs offer potential for demystifying L2 spatial language, making this seemingly intractable area more accessible to learners.

One of the most fundamental human experiences is viewing spatial scenes, i.e. objects in relation to each other. There are innumerable reasons why humans need to communicate with each other about objects in their environment, thus it is no surprise that every language has a system for communicating spatial configurations between two (or more) objects. Gestalt psychologists identified a number of unconscious perceptual mechanisms that result in a reformatting of our direct experience with

the world into what we perceive. These cognitive mechanisms constrain and provide particular structure to human experience. The work of the Gestalt psychologists firmly established that humans do not perceive objects and their relations in the world as a flat visual array. Rather, the human perceptual system organizes our conceptualization of the spatial scenes we encounter in terms of foreground and background, or figure (F) and ground (G). Within a spatial scene, the F tends to be the smaller, more moveable element which is the focus of attention; the G is the larger, less moveable, locating element.

In English, prepositions provide the primary system for describing spatial relations. Most typically, prepositions describe a conceptualized spatial relationship between a focus element (F) and a locating or ground element (G).

While the most basic relationship denoted by a preposition is spatial, all English prepositions have developed complicated polysemy networks in which many of the meanings are non-spatial. (The polysemy of spatial language is not unique to English). Drawing on insights from CL, the multiple meanings associated with English prepositions can be represented as being systematically related within a motivated semantic network. We hypothesize that representing the many meanings associated with a preposition as a systematic network, whose principles of semantic extension draw on salient human experiences with the physical world, has the potential to provide a useful rubric for aiding L2 learners in mastering the semantic complexities of prepositions.

2.2 Embodied experience: Spatial relations as spatial scenes

In this section, we discuss only those tenets of CL that apply directly to the analysis of English prepositions used in our experiment. CL argues that 1) conceptual structure is crucially shaped by our human perceptions of and interactions with the real word, and 2) language is a reflection of human cognitive structure. Accordingly, given the premise that experience and human neuro-anatomical architecture (i.e., the world we inhabit and the nature of our bodies) give rise to meaning, it seems highly unlikely that conceptual representations will be structured in terms of propositional representation (Cienki, 1998; Johnson, 1987; Langacker, 1987). Rather, concepts, derived from sensorimotor interaction with the world may be more appropriately modeled in imagistic terms. The notion of imagery is explored extensively by Johnson (1987), Langacker (1987) and Dirven and Verspoor (1998).

Johnson (1987) defines such representations as image-schematic structures which are "constantly operating in our perception, bodily movement through space,

and physical manipulation of objects" (Johnson, 1987: 23). On this view, image-schemas are abstract conceptual structures, which emerge as part of our meaningful interaction with the external, physical-spatial world. Important empirical support for this position comes from researchers in psychology such as Gibbs (2006)and Mandler (e.g., 1988; 1992, 1996, 2004).

Under such an analysis, the different patterns observed in the language are not only understood in a much more coherent manner, but they are ultimately linked to non-language specific, general cognitive abilities arising from human physiology and experience of interaction with the world. In particular, a great deal of linguistic phenomena has been argued to have a firm grounding in physical-spatial experience (e.g. Boroditsky, 2000; Lakoff & Johnson, 1999; Langacker, 1987; Mandler, 2004; Richardson, Spivey, Barsalou, & McRae, 2003; Spivey, 2007; Talmy, 1988, 2000). In other words, much of our conceptual structure, and hence the way we think and talk, is shaped by our particularly human, external experience with the world.

Following Tyler & Evans (2001, 2003), we assume that a preposition designates a conceptual *spatial relation* between an F element and a G element which is conceived as constituting an abstract *spatial scene*. Conceptual content can be abstracted away from specific spatial scenes, giving rise to a highly abstract and schematized representation.

The analysis further assumes that the various additional meanings associated with each preposition were ultimately derived from the preposition's central spatial scene.

In addition to the spatial configuration between an F and a G, the concept prompted for by a preposition also involves a functional element, which arises as a consequence of the particular spatial configuration between the F and G (Evans and Tyler 2004b; Tyler and Evans, 2001a, 2003; Vandeloise, 1991, 1994). In the case of *in*, for example, the spatial configuration involves a G in a surrounding configuration vis-à-vis the F (Talmy, 2000); the functional element involves the notion of containment. Johnson (1987), for instance, has argued that the functional element of containment involves numerous properties including location, confinement, protection, and potential obscuring of the element(s) being contained. See Tyler & Evans (2003) and Evans & Tyler (2004) for a fuller discussion of the functional consequences of containment.

2.3 Principles for extending meaning from the spatial to the non-spatial

2.3.1. Communicative nature of language and contextualized interpretation of lexical items

Assuming that a lexical item is initially used to indicate an established meaning, we believe that a speaker attempting to communicate with a listener would only use that lexical item to mean something new or different from the established meaning if they believed the listener had a reasonable chance of understanding the new meaning. This understanding presumably would come from inferences arising from the situated use of the lexical item. This suggests that the additional meanings that have come to be associated with prepositions which were originally spatial in meaning first arose from contextualized uses and inferences that were derivable from context. With repetition, the inferences became independently associated with the lexical form, e.g. *to, for* and *at*, as additional, distinct senses.

2.3.2. Construal or ways of viewing a scene

Every spatial scene is conceptualized from a particular vantage point. The conceptualizer represents the default vantage point and is usually off-stage. However, the same scene can be viewed from different vantage points. Shifts in vantage points can give rise to new inferences. Certain parts of a spatial scene can be highlighted or profiled. Additions or shifts in highlighting can give rise to new inferences, which in turn can give rise to additional senses.

2.3.3. Metaphorical thinking

One of the most important discoveries associated with CL is the ubiquitous nature of conceptual metaphor (e.g., Lakoff & Johnson, 1980; Lakoff, 1987; Grady, 1997, 1999). Following the notions of embodied experience discussed above, the basic insight is that humans regularly think and talk about internal, often more abstract experience (such as emotions, thought processes, and states) in terms of our experience with the external, physical-spatial world. Conceptualizations of recurring experiences with the world become entrenched in human memory and form foundational patterns for further conceptualization (Mandler, 1992; 2004). This is thinking metaphorically, a common, universal cognitive process.

Humans regularly observe the recurrent co-occurrence of two distinct phenomena. With repeated exposures, the two distinct but co-occurring phenomena

become strongly associated in memory such that we conceptualize and talk about one in terms of the other. For example, beginning in infancy, the child experiences a sense of well being when she is held and fed. Thus, physical proximity becomes associated with love and intimacy. Later, people who are good friends or important family members are often in close physical proximity. The result is that we form cognitive associations between two the separate phenomena such that we can use language about physical proximity to describe emotional intimacy, as in: *My sister and I are very close*. Grady talks about this as primary metaphor or experiential correlation (Grady, 1997, 1999; Lakoff & Johnson, 1999).

2.3.4. Real world force dynamics

As a default, speakers assume that all elements in a conceptual spatial scene are subject to real-world force dynamics, such as assumptions about motion along a path or that objects are subject to gravity (Talmy, 1988; 2000). When interpreting a novel, contextualized use of a lexical item, speakers assume that real world force dynamics are in effect.

3. A CL analysis of to and at

3.1. Overview

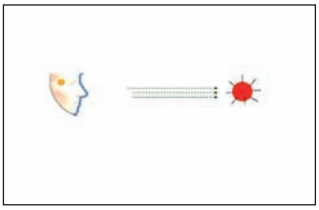
In this section we present a basic CL analysis of the prepositions *to* and *at* in order to acquaint the reader with the theoretical underpinnings that guided the development of the instructional materials used in this study. The analysis is based in Tyler & Evans' (2003) theoretical analysis of the semantics of English prepositions. Tyler & Evans (2003) argued that it was possible and insightful to represent the meaning of prepositions through diagrams as their central senses represent spatial relations between two objects. They further argued that using diagrams allows us to avoid propositional definitions which are often vague and confusing. (They make no claims about the psychological validity of these diagrams.) The various meanings of the prepositions discussed here are illustrated with the more learner-friendly visuals used in the experiment, rather than the somewhat more technical diagrams developed by Tyler & Evans (2003).

3.2. Analysis of to

3.2.1. Central representation of to

Using a set of guiding principles, Tyler & Evans (2003) determined that the central meaning of *to* involves a spatial scene with an oriented F facing a highlighted G element. This is meaning is represented in figure 1.

Figure 1. Diagram representingthe central meaning of *to*



The oriented F element is represented by a face that is turned towards the G, which is represented by the sphere. Note the sphere has lines radiating from it. This represents the additional notion that the G is also interpreted as being a goal Tyler & Evans (2003) term this additional goal interpretation as the functional element associated with *to*. In the vast majority of circumstances, people (and animals) face in the direction of an object towards which they are moving (or intend to move). They also face in the direction of objects they are interested in. The intended endpoint of their movement or the object of interest about which they gather information are understood as goals.

In the sentence *The worshipper faced to the east,* the *worshipper* represents the F and *the east* represents the G.. In this sentence, the verb *faced* prompts for a static scene. However, we know that in many instances in the physical-spatial world, the F element is in motion, as represented in the sentence *Jane walked to school.* When the verb indicates motion, *to* marks the endpoint of the motion. We understand that Jane followed a path to get from her starting point to the school. Additionally, we understand that the school is the goal of Jane's trip, it's where she is going to be at the end of her travel. In the scene depicted by this sentence, Jane's body is transferred from point A to the school. Based on our knowledge of basic force dynamics, we understand that all movement involving transfer of an entity from one point to another entails a beginning, a path that the moving object follows, and an endpoint. In English, *to* marks the endpoint of the motion.

A ubiquitous part of our physical-spatial experience involves moving or transferring an object from one location to another. As depicted in the sentence:

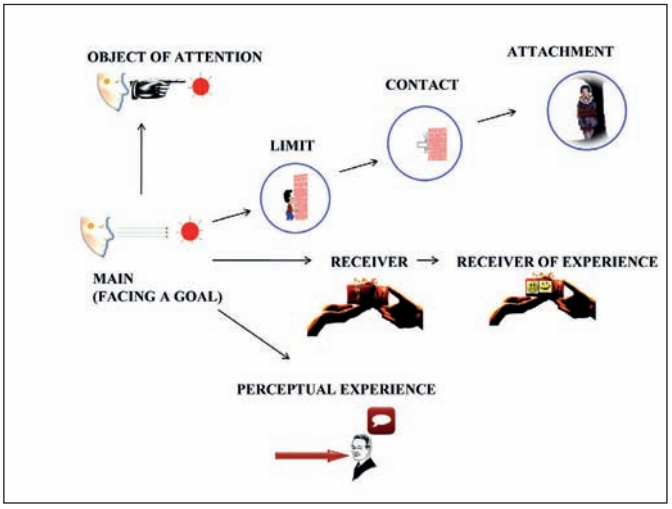
1) Nicole moved the chair from the living room to the dining room.

Again, *to* marks the endpoint of the movement.

3.2.3. Extended senses

In our earlier discussion of the situated use of language, we noted that prepositions, like all words, rarely occur in isolation when they are used in real communicative situations. As they occur in various contexts, new interpretations can arise which, if they prove useful, become associated with the preposition through recurring use. This new interpretation presumably would come from inferences arising from the situated use of the lexical item. This suggests that the additional meanings that have come to be associated with *to* or *at* originally arose from contextualized uses and inferences that were derivable from context. Space limitation will not allow us to discuss all the extended meanings of the prepositions that we included in the study. Below we provide a representation of the polysemy network for *to*. In this representation, we use visuals meant to provide memorable, meaningful representations for the L2 learners. We will refer to this representation as the meaning map for the senses. We will limit our discussion to the following senses: Receiver, Receiver of Experience, Limit, Contact, and Attachment.

Figure 2. Meaning map of the extended meanings of *to*



3.2.3.1. Receiver

As we just noted, people often move (or transfer) an object from one location to another with *to* marking the endpoint of the motion. An important variation on this movement is when the endpoint is another person.

2) *Frank gave the present* ***to*** *Charles.*

Charles represents the end point of the movement. Unlike an inanimate endpoint, we understand that a human (or other animate being) will experience the transfer of an object to them. In this case, Charles **receives** the present. *To* still marks the endpoint, but when the endpoint is a person, we understand the person is a Receiver who undergoes some effect as a result of receiving the object. Tyler & Evans (2003) argue that this notion of affectedness creates a closely related but distinct sense in the polysemy network of *to.*

We represent the Receiver sense with a diagram in which one hand is transferring a present to a second hand. In this diagram, the present represents the F element and the second hand represents the G/Receiver.

As we noted above, CL argues that a common, universal, human cognitive process involves thinking about internal, often more abstract, experiences in terms of our experience with the physical-spatial world. A common pattern involves extending language from the physical world to express notions about emotions or thinking processes in terms of objects (Lakoff & Johnson, 1980). English speakers often talk (and think) about emotions as if the emotion is an object. A basic metaphor in English is: EMOTIONS ARE OBJECTS.

When emotions are conceptualized as objects, they can be talked about as if they have the typical attributes of objects, such as entities that can be manipulated and transferred from one person to another.

3) *a. Juliette gave her love to Romeo.*
b. Paul gave his complete loyalty to his wife.
c. *I'll send all my loving to you.*

In these sentences, we talk about the emotion as being directed towards or transferred from one person to a Receiver. The emotion is the moving object. The Receiver is the endpoint. *To* marks the Receiver of the emotion.

3.2.3.1.1. Receiver of experience

We find a similar pattern with reference to behavior or experiences that affect another person. In the following sentences, Cathy's behavior is directed at someone.

4) a. *Cathy is nice to John.*
b. *Cathy is nasty to Ellen.*
c. *Cathy is kind to her dog.*

English speakers talk about the behavior as an object that moves from A to B. Thus, the adjectives *nice, nasty, etc,* are the F element in these sentences. (Here, the adjectives such as *nice, mean, kind* are acting like metonymies as they summarize a whole set of behaviors undertaken by the subject and directed towards the G.) *To* marks the Receiver of the behavior or the experience.

3.2.3.1.2. Receiver of perception

English speakers use very similar patterns to talk about the results of perceptual experiences (e.g., seeing, tasting, hearing, smelling, feeling) as they use to talk about movement of entities in the external physical-spatial world. Humans do not have direct access to the external physical-spatial world. The external world is always filtered through the human perceptual systems. This is self-evidence when we stop and consider that bats hear frequencies that humans cannot hear or wolves see a different range of heat and light than humans. Thus, what humans experience as the 'real world' is different from the conceptualized world represented in the human mind. The human perceptual systems provide the essential interface between the external world and the internal conceptual world. (Because all humans have essentially the same perceptual operating systems and deal with essentially the same physical-spatial world, humans tend to conceptualize the world in similar enough ways that we feel we experience the same world). English draws on the metaphor EXPERIENCES ARE OBJECTS to talk about perceptual experiences. The result of perceptual experience is the F element, the person (or animate being) is represented as the Receiver of the experience.

5) *This milk smells fresh to me.*

In this sentence, the olfactory experience of *freshness* is the F element and the person undergoing the experience of smelling, *me*, is the Receiver of the perceptual experience. Although perceptual information can be treated as neutrally updating one's mental model of the world, in many instances humans make an evaluative judgment about the results of the experience.

6) *This bread tastes good to me.*

The thing or event that stimulates the seeing, tasting, etc. is in subject position. Within the predicate, the assessment of the stimulus is treated like the focus F element that moves, the perceptual system represents the path to the person who receives the experience. *To* marks the Receiver of the perception (or the metaphorical endpoint of the motion).

7) a. The music sounds good to me.
b. *This fish smells bad to me.*
c. *This cloth feels itchy to me.*

As we noted earlier, a common pattern of meaning extension found in most languages is using language from the physical situation to talk about a more abstract situation or a situation concerning internal, cognitive processes. The language used to describe physical perceptions has been extended to talk about more abstract or internal perceptions or conclusions. The person who draws the conclusion is the Receiver of the conclusion or evaluation:

8) a. *The plan* ***sounds*** *good* ***to me****.*
b. *The student's homework* ***looked*** *good* ***to the professor****.*
c. *The situation* ***felt*** *uncomfortable to* ***June****.*

This pattern has been further extended so that verbs of perception need not be used.

9) *His attitude is strange to me.*

This use of *to* usually involves situations in which the Receiver expresses an evaluation about someone's behavior or the situation.

10) *It's inconceivable to me that BP would do deep drilling without a backup plan.*

Seems is a verb that originally meant 'to appear'. It is still closely related to perceptual experiences. *Seems* is often used to talk about more abstract, internal processes having to do with thinking or drawing conclusions. *Seems* follows the same pattern as other verbs of perceptual experience:

11) *Climbing Mt. Everest seems dangerous to most people.*

To marks the receiver of the perception (or mental conclusion).

3.2.3.2. Approaching or reaching the goal senses

3.2.3.2.1. Limit

In many instances, a goal represents a limit on the activity you engage in. When you reach the goal, you cannot go any farther. For instance, if you climb a mountain, the highest you can go is *to* the top. In a swimming competition, the swimmers' goal is to reach the other end of the swimming pool as soon as possible. Once the swimmer reaches the opposite end, she can't swim any farther from the starting point. So, we say:

12) *The swimmers swam to the opposite side of the pool.*

Other examples of the Limit sense include**:**

13) a. *Einstein pushed his ideas to their logical limits.*
b. *The pirates fought a duel to the death.*
c. *The desperate housewives want to rise to the heights of stardom.*

3.2.3.2.2. Contact

We understand if the scene being depicted involves motion towards a goal, the F element will move closer to the G. Sometimes, when a goal is reached, there is contact between the F and G elements. *To* has developed an extended sense of contact or close proximity between the F element and the G, as in the phrases: *shoulder to shoulder, cheek to cheek,* and *face to face.*

3.2.3.2.3. Attachment

A natural consequence of two objects being in contact is that they may become attached to each other. *To* has developed the extended meaning of attachment.

14) *This guy is tied to the tree. He is attached to the tree.*

Not surprisingly given the central spatial scene for *to* which involves an oriented F element, in many cases when *to* is used to indicate attachment, the F element has an orientation. The Focus element's oriented shape facilitates its attachment to the Ground:

15) *Charles attached the flash drive to the UBS port.*

A common grammatical operation in English is to extend the scope of a noun so it acts as a verb. In the following sentences, verbs that are conceptually connected to oriented nouns and indicate some sort of physical attachment co-occur with *to:*

16) a. *Jeff* ***nailed*** *the sign to the fence.*
b. *Jean* ***tacked*** *the message to the bulletin board.*
c. *Marylee* ***taped*** *the note to the wall.*

This attachment sense of *to* has been extended metaphorically to talk about more abstract situations or states. For instance, when two people are married, they are often physically together, perhaps holding hands or walking with their arms around each other. In Christian marriage ceremonies, the ritual language uses the terms 'join together'. Thus, English speakers say:

15) *Steven is married to Sandy.*

There are many other situations in which a person is often physically close to another animate being or even an object or substance and forms an emotional or psychological attachment. English speakers use *to* when speaking about these relationships:

16) a. *Katherine is quite attached to her pets.*
b. *Walter is addicted to alcohol.*

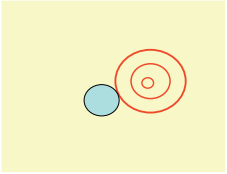
3.3.1. At

Tyler & Evans (2003) analyzed the central meaning of *at* as a spatial scene in which two objects are either very close or in the same location. As in the sentence:

17) *The house is at the corner of 5th and Vine Street.*

We use the following visual to represent the Focus and Ground relationship prompted for by *at*.

Figure 3 Diagram representing the central meaning of *at*



The small sphere represents the F element and the large sphere represents the G. This is a relationship of co-location.

3.3.2. Extended senses

Again, because of space limitation, we cannot discuss all the extended meanings of *at*. In all, seven extended senses were taught. Here we will limit our discussion to the Functional and Intensity senses.

3.3.2.1. Functional

When the Focus element is a human, we usually assume the person is located in close relation with an object for a reason. In other words, unless we have evidence to the contrary, we assume a person is acting intentionally or with some purpose in mind. When the F object is a person co-located with an inanimate object, we often assume the person is in an *at* location for a particular reason. Often this is so the person can interact with the G object in a useful way. For instance, consider the image that arises when you hear the sentence:

18) *The pianist is at the piano.*

The most likely image that arises is that pianist is facing the front of the piano so that she can manipulate the keys. Other physical configurations are possible. She could be sitting with her back resting against the piano. She could be sitting at the back of the piano. But the prototypical configuration would involve a functional relationship between the pianist and the piano. Similarly when we say someone is *at the computer* the typical interpretation is that the person is facing the computer screen and keyboard so that a functional, meaningful interaction can take place between the person and the computer. Thus, in many contexts, *at* does not prompt for a neutral conceptualization of simple co-location, but a conceptualization of an interactive, functional relation between the F and G. Herkovits (1986) and Evans (2010) refer to this as the notion of practical connection. *At* has developed an extended sense of functional interaction.

3.3.2.2. Intensity

Quite often, when people interact with an object which can be construed as a G element, they are very busy and meaningfully engaged with it. This leads to an extension of *at* that conveys intensity of the activity. When a bee buzzes around

a flower, it will be very active as it engages in collecting nectar from the blossom. English speaker can say:

19) *The bees have been at those flowers all morning.*

In everyday life, we are often intensely focused and active with objects we are physically close to or collocated with:

20) *Kim has been at her books all morning.*

In certain contexts, the notion of one person being intensely focused on what another person is doing can have a negative connotation:

21) a. *My boss is always at me to work faster.*
b. *My mother was at me all morning to do my chores.*

This sense of intensity has been has extended to activities and states:

22) *Kim is hard at her studies.*

Applying cognitive linguistics to second language learning

In spite a good deal of interest in the potential of applying CL to L2 learning (e.g., Achard & Neimeier, 2004; Boers & Lindstromberg, 2008; De Knop & De Rycker, 2008; Ellis & Cadierno, 2009; Holme, 2008; Pütz, Niemeier, & Dirven, 2001; Robinson & Ellis, 2008) very few empirical studies that attempt to demonstrate the effectiveness of a CL-based approach to L2 pedagogy have been undertaken. We hypothesize that a CL-based model of the semantics of English prepositions, as outlined above, which represents the many meanings associated with a preposition as a motivated polysemy network, has the potential to provide a useful, organized rubric for L2 learners confronting the complex set of meanings associated with prepositions such as *to, for* and *at*.

Carrying out experimental investigations strikes us as crucial step in moving the field of Applied Cognitive Linguistics forward. However, just having an appealing theoretical description of language is not a silver bullet for L2 learning and pedagogy. Having a richer, more accurate description of the language should represent a valuable advance for second language learning but the theory has to be translated into effective teaching materials. A major challenge is to find ways to make the appropriate theoretical notions precise yet accessible to second language learners and teachers. Effective CL-based teaching materials must also attend to principles

from work in psychology and the field of SLA, i.e. the importance of noticing, interestingness, role of pushed input, and following Norris & Ortega (2000) explicit instruction followed by communicative tasks. The experiment we report here attempts to meet these goals.

4.1. Experiment

To examine the efficacy of using a CL-based approach to teaching the semantics of the English prepositions *to, for* and *at*, a quasi-experimental, effects-of-instruction experiment was conducted.

4.1.1. Participants

Fourteen participants completed all parts of the experiment. The 14 participants were professional English translators whose native language was Italian. All had studied English a minimum of 10 years. They were judged to be advanced learners. They were enrolled in a special, short term program at a major university in the US. The purpose of the program was to provide advanced instruction in English and in US culture. As part of their regular classroom instruction, the participants were presented instruction on the prepositions *to, for,* and *at*.

Prior to beginning the instruction, the participants were asked if they experienced any difficulties interpreting and translating these prepositions. All responded that, even though they had encountered the prepositions innumerable times and received standard instruction on their uses, they still felt unsure of many of the uses. They noted that prepositions were particularly hard because they had to memorize their many meanings and the verbs, adjectives, or nouns with which they collocated. They noted they often confused these memorized collocations.

4.1.2. Design

The following summarizes the overall design of the study:

Table 1. Overview of Experimental Procedure

Group	Session 1	Session 2	Session 3

Cognitive	Pretest	(1) 50-minute teacher-fronted instruction on TO (2) 30 minutes of pairwork	(1) 50-minute teacher-fronted instruction on FOR and AT (2) 30 minutes pairwork (3) Posttest

The participants took a pretest on the first day. In spite of their advanced level of English proficiency, the test revealed a number of gaps in their knowledge of the extended meanings of all 3 prepositions. They scored an average of 19.5 out of a possible 40 points (range, 13-28; S.D. 4). They were particularly weak on the extended meanings of *at*, scoring an average of 17.9% correct, as well as *to,* scoring an average of 49.2% correct. They had the greatest knowledge of *for*, scoring on average 72% correct.

The second day of the treatment, the participants received teacher-fronted instruction on the preposition *to* followed by pair work that focused on appropriately using the preposition in various scenarios. The third day, the participants received teacher-fronted instruction on *for* and *at*, followed by pairwork. After a 15 minute break, the participants took a posttest.

4.1.3. Pre and Posttests

Two tests were developed, Version A and Version B. The tests had a forced-choice, fill-in-the-blank format. The tests consisted of short dialogs or paragraphs, each of which was missing several prepositions. For each paragraph or dialog, the participants were asked to select the most appropriate preposition for each blank from among a list of possible choices. Participants were instructed to only use the choices provided. The dialogs and paragraphs were constructed so that only one choice for each blank was appropriate. The tests were piloted with native speakers of English and adjusted until each paragraph received 100% agreement on the appropriate preposition choices. Each test had 40 target items and 20 filler items. Subjects' scores on the filler items were not used in calculating scores.

The tests were blocked so that half the subjects received Version A as the pretest and half received Version B. Those who received Version A as the pretest received Version B as the posttest and vice versa. To determine whether the test forms were equivalent, the scores on the two tests were compared. A two-way ANCOVA with Test Form Order as a between subject variable and pretest scores as covariate was conducted. Mean scores for the Test Form A pretest group was 19.4, whereas the mean for the Test Form B pretest group was 19.6. The ANCOVA indicated no significant different between the Test Form orders, p = .91. In sum, the level of difficulty of

Version A and Version B were highly comparable.

4.1.4. The treatment

One of the researchers led a 50 minute teacher fronted, interactive explanation of a CL-based interpretation of the semantics of *to*. The researcher began by giving a brief explanation of words having a related network of meanings and the notion that the central meaning for each preposition designates a spatial relation between a Focus and Ground element. The teacher fronted instruction was accompanied by a power point slide presentation which contained numerous visuals, including cartoons and video clips. Each of the meanings was represented by a diagram which attempted to reflect that meaning. The diagrams for *to* and *at* and select extended senses appear above.

The teacher-fronted instruction was followed by two interactive tasks in which the participants worked in pairs. The participants were given a worksheet with an unlabeled meaning map of the visual representations of the network for the preposition. With their partner, they filled in the correct labels accompanying each visual. The researcher circulated among the pairs to make sure the participants labeled the map appropriately. Once they had labeled the maps, the pairs made up one sentence for each of the meanings. For instance, for *to*'s Receiver sense, they produced a sentence such as *Ron threw the ball to Lisa*. Again the researcher circulated among the pairs to check the accuracy of their uses of the prepositions.

For the second task, participants were given a set of headlines, each of which used a different meaning of the preposition. The participants wrote a two sentence story that matched the meaning of the preposition in the headline. For instance, the headline demonstrating *to*'s perceptual experience sense was : *Water in the Gulf Region Tastes Foul to Birds in the Area*. All pairs completed the tasks in the allotted time.

4.2. Results

Except for one participant who went from 23 on the pretest to 22 on the posttest, all the participants gained on the posttest, going from M = 19.5 (48.8%) to M = 24.4 (60.9%) out of 40 possible. Average gain was 4.9 points or 12 % (range -1 to 13; S.D. 4.6). Individual pre- and posttest scores appear in Table 2.

Table 2. Participants' individual pretest and posttest scores

Pretest	Posttest
14	27
13	17
16	17
19	26
22	26
20	22
19	27
28	32
19	25
19	26
16	19
22	31
23	24
23	22

Participants also showed gains on all three prepositions, although the gains on *for* were slight. The gains for individual preps are represented on Table 3:

Table 3. Gains on individual prepositions presented in percentages

At Pretest Posttest % Gain	To Pretest Posttest % Gain	For Pretest Posttest % Gain
17.9% 32.1% 14.2 %	49.2% 66.8% 17.6%	72.0% 75.3% 3.3%

Since this was a within subject design, a paired t-test was performed on the participants' pre-and posttest results. The test showed that gains were highly significant (p = .0003).

4. 3. Discussion

The results of the statistical tests indicate that the participants experienced significant gains in their understanding of the many meanings of *to, for* and *at*. Even though none of the participants attained 100%, we argue the gain was considerable in light of the limited duration of the treatment. Participants received approximately

2 hours of instruction on the meanings of the three different prepositions. They had many new concepts to learn. For instance, they were asked to think about the various uses of the prepositions in terms of polysemy networks extended from a central spatial scene and consider the role of metaphor in meaning extension. These represent radically different ways of thinking about the meanings of the prepositions. At the same time, they were asked to learn specific, new meanings for each of the prepositions presented and think about how the prepositions are used to make meaning in context. This represents a set of relatively heavy cognitive demands.

Moreover, these were professional translators who were advanced learners. Given the amount of English they are exposed to on a regular basis, it is probably fair to say that, relying solely on input and implicit learning, they had reached their end state. The fact that two hours of instruction could result in improvement for all but one of these learners indicates that a CL-based explanation can make valuable contributions to advanced learners' understanding of the prepositions.

Tyler and Evans (2001b, 2004) argued that CL offers a number of important benefits for pedagogical grammars over more traditional approaches. First, a systematic, motivated account of the range of conventional meanings associated with a single preposition, a *semantic network*, cuts down considerably on the amount of arbitrariness and hence reduces the need for rote learning on the part of the second language learner. Second, because the model draws heavily on the notion of the experiential basis of meaning and represents the extended senses as arising from observations of the external, physical-spatial world, it reflects the learners' own experiences with the world. Understanding the motivation behind the extended meanings as being experientially motivated and coherent with the learners' own observations of the world would seem to make these meanings easier to acquire. Third, the various meanings are represented as gestalt-like conceptualizations of situations or scenes which are systematically connected, rather than a series of discrete dictionary-type definitions strung together in a list. Such graphic representations can provide visual rubrics that may be useful presentational tools for the language teacher and useful aids for the second language learner. (This was the intent of the meaning maps we presented the participants).

Conclusions

This study represents a hopeful first step in experimentally investigating the usefulness of a CL-based approach to teaching the semantics of English prepositions.

However, we must interpret the results cautiously as there are a number of

limitations with the study. The within subject gains were impressive, but they do not give us information about the relative efficacy of a CL-based approach. The power point presentations contained many engaging visuals and contextualized uses of the prepositions. Participants receiving similarly engaging materials, but without a CL-basis, might have made similar gains. To say with confidence that CL-based instruction provides a superior basis for L2 learning, future experiments must include a control group who receives a carefully constructed, non-cognitive treatment.

The participants showed significant gains between the pretest and the immediate post test. To know if these gains represent a deeper understanding of the extended meanings and the meaning extension processes, such as metaphor, a delayed posttest is essential.

The participants represent a narrow population. They were advanced learners. Certainly experiments with participants with a broader range of proficiency is important. Moreover, these participants were professional translators who were trained to be analytical and likely had a high level of meta-linguistic awareness which might have made them more attuned to the subtle semantic differences in prepositional use. Additionally, they were all native speakers of Italian, a language which is related to English and which also has numerous prepositions. In fact, we believe one reason they performed so well on *for* is because Italian has a cognate preposition which has many of the same extended meanings as English *for.* Experiments with participants with different language backgrounds, including those not related to English is an important step in determining the robustness of the treatment.

Finally, the experiment had only one measure of knowledge of the prepositions. As a minimum, future experiments should include a second measure which asks participants to produce prepositions. Tyler & Evans (2003) term this additional goal interpretation as the functional element associated with *to.*

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