CHILDREN'S MAPPING OF MEANINGS ONTO NEW VOCABULARY IN FIRST LANGUAGE ACQUISITION

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Abstract

As children acquire their first language, they face challenges that pertain to mapping which can defined as establishing meanings for new words. This paper endeavours to review some of these challenges from a theoretical perspective. Two mapping strategies are presented and discussed; the direct instruction from adults and inference of meaning. The paper also reviews theoretical foundations as well as factors that contribute to various solutions to these challenges.

Keywords: First Language Acquisition, Child Language Acquisition, Mapping Meaning, Fast Mapping, Theory of Mind

1. Introduction

How and when children start mapping meanings onto new forms and the problems that come along the way in that process have been hugely discussed in the literature of first language acquisition. The aim of this paper is to review the mapping problems children encounter and factors that control their solutions to these problems.

This paper begins by providing some definitions for the mapping process as suggested by a number of researchers in the field of first language acquisition. Then, it discusses strategies used by children to map meanings onto novel words. This is followed by the main review which considers the interaction between language and cognition in the production of meanings. The following section presents some of the factors that play an important role in the way children solve mapping problems. These include social interaction, the role of pragmatics, the role of working memory, and the role of the theory of mind. Finally, the conclusion section briefly summarizes what was discussed in this paper.

2. Definitions

When young children encounter a new word, they often guess its mean surprisingly accurately (Swingley, 2010). This is referred to as the mapping process in child language acquisition. Also, Deak and Wagner (2003) define the mapping process as "a system of constraints specialized for acquisition of word meanings." Most of mapping definitions in the field of child language acquisition are based on the classical definition of Carey and Bartlett (1978) which defines it as a hypothesised process that enables children to rapidly create lexical representations for the unfamiliar words they encounter. They suggested this definition after conducting their classical study in which they casually asked children aged three and four to walk over two trays, one

blue coloured and one olive. They gave the following instruction to the children: "bring me the chromium tray, not the blue one, the chromium one." From this instruction, the children could infer that the new word meant the new colour. They called this process of quick learning "Fast Mapping".

Gleitman & Gillette (2004) suggest another definition that takes vocabulary into consideration. It describes how word-level concepts are matched with their phonological realisations in the target language.

3. Mapping Strategies

Here, I present two mapping strategies. The first is direct instruction from adults and the second one is inference. On the one hand, the direct instruction strategy involves an adult pointing to a novel object and naming it and the child's role is, then, to associate the word they just heard with that object. On the other hand, Brinster (2007) defines the second strategy that children use to map meanings onto forms as a process in which toddlers use reason (such as the process of elimination) to mentally "fasten" an unfamiliar word to an unfamiliar object. Another definition for inference deals with educated guesses children can make about a word's meaning based on its' context after only one or two exposures: the larger a child's vocabulary, the better they are with this phenomenon (Drye, 2009).

The first strategy, as the name suggests, is straightforward and therefore I will shift focus to the second strategy by highlighting the work of Brinster (2007). She conducted an experiment to compare the two strategies. She tested 100 children between the ages of 36 and 42 months on how well they learned from the direct instruction and the inference methods. Testing the inference method, Brinston showed the children familiar and unfamiliar objects such as a ball and a T-shaped plumber's

connector. After saying a nonsensical word such as "blicket", she asked the children to point to or grab hold of the matching object. Since the children already knew what a "ball" was, they associated the unfamiliar object with the word "blicket". She tested the direct instruction method by showing the toddlers an unfamiliar object and saying the nonsensical word. After a short time, she would invite the children to play in her laboratory waiting area with familiar toys and would ask them questions such as "I think one of these is called *blicket*, but I can't remember which one it is. Can you help me? Do you know which one is the *blicket*?"

She concluded that knowledge gained via a child's own inferences is sometimes more powerful and longer lasting than knowledge gained through direct instruction.

4. Review

Learning the meanings of things and actions from observation alone has been criticised in the literature as insufficient. Researchers have shown that mapping is not just a matter of simply pairing words (phonological objects) with their standard contexts of use, neither is it sufficient to learn the meanings of things by observation alone. Indeed, the process of mapping is performed not only by observation and phonological associations, but also by pairing sentences (syntactic objects) with some context.

Gleitman and Gillette (2004), for example, conducted two experiments to measure the difficulty of pairing word-level concepts with their phonological realisations. One experiment dealt with concrete nouns, while the other dealt with verbs. In the first experiment, adult subjects were shown muted conversations between mothers and infants and were told that the study was interested in the use of nouns. When the mother uttered a noun, a beep was sounded and they had to guess what the

target word was. The adults guessed correctly 50 % of the time. In the same settings, the same subjects were told, in the other experiment, that they were after verbs and were asked to guess which verb the mother was uttering. The results were significantly different this time with only 15 % guessing the verb correctly. This led Gleitman and Gillette (2004) to introduce their "Zoom Lens Hypothesis", which stipulates, "The first use of structural information is as an online procedure for interpreting a novel word. Though there may be quite a few salient interpretations of the scene, the learner "zooms in" on one (or at least fewer) of these by demanding congruence also with the semantic implications of the sentence form" (p. 158). This structural positioning of the verb is exemplified in the non-word verb "zike". In the sentence, "Mary zikes the ball to John", the possibilities of various interpretations to this novel verb are narrowed down to a minimum by the process of elimination of irrelevant possibilities. These possibilities include "give" or "throw". When used as "Look! Ziking!" and depending on the scene, a large number of possible and relevant interpretations of the novel verb are generated. From this, they concluded that verb acquisition requires access to the phrase structure and semantic implications of the exposure language, a process that takes infants some time to get under control.

Moreover, Bloom (2000) adds some quite interesting ingredients to this recipe believing that children have the ability to acquire new concepts, understand syntactic cues to meaning, and have an awareness of the mental states of other people. He claims that these features are almost unique to the human brain and that they develop early in children's lives.

In the literature of child language acquisition, it is suggested that children's first words tend to include more nouns than verbs. Gentner (1982: 327) found that "In case

studies, children learn nouns before predicate terms; in early production vocabularies, nouns greatly outnumber verbs".

Introducing his Natural Partitions hypothesis, Gentner (1982) believes that children learn concrete nouns earlier than verbs or other syntactic categories of their transparent semantic mapping to what he calls a "perceptual-conceptual" world. He claims that even pre-linguistic infants see the objects that are parts of the perceptual world as coherent and logical and therefore these objects are easy to learn, as infants have formed concepts of objects, and all they need to do is to link the words with the concepts.

Bloom (2000) delves into the issue of "Whole-Object" bias that infants have when they hear a new word. This means that the vocabulary of children is usually loaded with names for objects such as *ball, dog,* and *cat,* which are present in the speech directed to them by adults. For instance, when they hear a word in the presence of an object such as a ball, they interpret *ball* to refer to the whole object category not only that certain part of that category. He believes that this is the case cross linguistically and across cultures. This bias, which is part of the Priori constraints that apply when children assign meanings to new objects, was also discussed by a number of scholars and researchers including Elizabeth. S. Spelke, a professor at the department of Psychology at Harvard University and Eve Clark.

Clark (2003) discussed the Priori constraints that children observe when they map forms onto linguistic expressions. The first of these constraints is the above-mentioned Whole-Object assumption. It means that children as young as 18 months already have categories for objects, so when they face a new object, its category already exists.

The second is the taxonomic assumption, which assumes that children use words to pick out categories of objects rather than associated clusters of objects. For example, when the term *squirrel* is introduced, children assume that it identifies squirrels only and not squirrels eating nuts. The third is the basic level assumption which, according to Clark (2003), "captures the fact that the categories of whole objects favoured by one- and two-year olds tend to be categories that psychologists have identified as the basic level" (p. 135).

The equal-detail assumption suggests that children who already have the term *dog* for dogs look for a category that matches the same level of specificity when they try to map a new term such as *cat*. Under this assumption, children know that *cat* refers to cats in general not a specific type of cat.

The last assumption discussed by Clark is the mutual exclusivity assumption, which suggests that children do not allow more than one form for the same referent. For instance, when a child learns the term for *dog* he/she will not, according to this assumption, assign this term to *animal* or *pet*.

In Spelke's (1994) study, she argues that pre-linguistic infants possess a strong bias to analyse the world into "discrete bounded entities" which she calls "Spelke Objects". These entities correspond to what is known as *objects* in the literature of child language acquisition. The arguments suggested by Spelke (ibid), regarding pre-linguistic infants' knowledge of objects, the knowledge of syntactic features suggested by Gleitman and Gillette (2004), and the notion of the cognitive dimension suggested by Bloom (2000), all shed light on the possibility that children's first vocabulary items may have non-linguistic and/or pre-linguistic origins.

Markson and Bloom (1997) conducted an experiment to investigate whether fast mapping applies to domains other than language learning. Their experiment included

48 three-year old children, 47 four-year olds, and 48 undergraduates who were introduced to 10 objects, of which, six were novel items, and four were familiar to the participants. The participants were trained on these words for twenty minutes and their task was to use some of the objects to measure other objects. For instance, they were told to use the pennies or a "koba" to measure the circumference of a plastic disc. The objects were presented to them in three ways: by using the new word "koba", by saying that the objects had been given to the experimenter by her uncle, and by placing a sticker on the objects. Once all objects had been presented, they tested the participants' ability to recall the objects. Every age group was tested three times, immediately, after one week, and after one month.

The results of the experiment were interesting. In the novel word experiment, they found that all participants from all three age groups performed very well in all three delay settings and that the adults did significantly better than the other two groups during the immediate response phase. In the uncle experiment, all groups performed equally well which led the authors to suggest that fast mapping is not unique to word learning. In the third experiment, children and adults performed worse in remembering which object to place the sticker on. Markson and Bloom (1997) found that there was no critical period for fast mapping and that children were much better at learning phonology, morphology, and syntax than adults. They concluded that word learning is from other aspects of language development in humans and that "word learning is mediated by processes of human learning and memory that are not special to the domain of language" (p. 815).

This brief review of literature has shown that the process of mapping meanings onto words in not a simple task but rather one that is performed not only by observation and phonological associations, but also by pairing syntactic objects

(sentences) with some context. It has also shown that certain categories of vocabulary are easier than other categories for children to map meanings onto. Following this review, the next section considers factors that may contribute to how children solve mapping problems.

5. Factors controlling children's solutions to mapping problems

5.1. The Role of the Theory of Mind

One of the most common ways to teach children new words is to point to the object and say its name. Children learn new words via their sensitivity to the referential intentions of the speaker taking advantage of the Theory of Mind. Premack and Woodruff (1978) provide a famous definition of this theory by asserting that it is the ability to attribute mental states, such as beliefs, intents, desires, pretending, knowledge, etc., to oneself and others, and to understand that others have beliefs, desires, and intentions that are different from one's own.

In the literature of child language acquisition, it is suggested that children learning new words make use of mentalistic cues like eye gazes and emotional expressions. Baldwin (1991) carried out a study in which infants hear a novel word "*Toma… there is a Toma*" and stare at a novel object. One would assume that the young children would look at the object and successfully map *Toma* with it. Baldwin discovered that this is a correct assumption only if the speaker is looking at the object when he/she is saying the novel word. If the speaker is looking at another object or in another direction, Baldwin argues that this results in the child making a mapping error. Furthermore, I find this idea plausible from personal experience of teaching new words to my children. I noticed that when I look at many different scenes but do not point at any in particular, they look at my eyes to find out at what I am gazing.

In addition, Bloom (2001) provides another role for the Theory of Mind in word learning, which pertains to young children naming objects created by humans, such as representational art. "When young children name pictures, by themselves and by others, they name them based on the intent of the artist, and do not rely on what the picture looks like. Even something as apparently simple as a two-year-old pointing to a scribble and calling it "Mommy" involves an impressive act of mentalistic attribution" (p. 1100).

5.2. Social Interaction

One important factor affecting children's solution to mapping problems is the social context in which the learning of new words takes place. Garton (2001) asserts that social interaction has a fundamental role in the development of knowledge, especially symbolic systems like spoken language that includes meanings of words and written language.

Bruner (1983) emphasizes that language ideally develops in a functional manner via social interaction with others, including parents and friends. He showed that children's communicative intentions were enhanced via interaction with parents, which resulted in awareness of the functions of language as well as its use in communication. He investigated many different everyday events to demonstrate that they were very helpful in providing children with a framework to learn not only word meanings but also the use of language.

From my own personal observation, I believe that social interaction plays a significant part in children's development, especially when learning new words. I raised my two young sons in two different social settings. The oldest was raised in the United States where we had a few friends who had children. His younger brother was

raised while we were in our home country where we had many relatives and friends. When we introduce somebody new, the youngest enjoys their company whereas the oldest gets frustrated when left with anybody except his parents or well-known relatives. Linguistically, my oldest son used to have a limited number of consonants and he found the production of these consonants hard, especially fricatives and affricates. More significantly, my youngest son is much better than his older brother at learning and producing words even though he is one year younger than him. On one occasion I remember, my youngest son successfully mapped *fish* with what he saw on television after only one exposure.

5.3. The Role of Pragmatics

Pragmatics deals with ways in which certain contexts contribute to the meaning of things. Therefore, it plays a key role when mapping is concerned. Two concepts are very important when we discuss pragmatics, *conventionality,* and *contrast*. Clark (2003) defines the first as a speaker's assumption that for certain meanings there is a conventional form that should be used in the language community. She also defines contrast as a speaker's assumption that any difference in form signals a difference in meaning. For example, when a child attends to a running squirrel, he/she infers that "squirrel" must refer to the animal and not to its action. According to what the child assumes, if the speaker were talking about the action, he must have used the conventional form "run" and since he has no term for squirrel yet, he/she assigns "squirrel" to that animal.

Clark (ibid) believes that children rely on many factors when they map a meaning to a certain form. She suggests that children rely on conventionality, contrast, their current linguistic knowledge about word-classes (whether a word denotes an

object, an action, etc.), and their knowledge of a domain and its members. For instance, when an adult points at a monkey in a book of animals and says "monkey" and before that, in the same situation, he pointed at a tiger and wolf, the child infers that "monkey" must belong to the same domain *animal*.

5.4. The Role of Working Memory

The working memory is part of the brain system that provides temporary storage and allows manipulation of the necessary information for complex cognitive tasks, such as language comprehension, learning, and reasoning (Baddeley, 1992). It is believed that the role of the working memory is crucial to learning the meanings of new words. Racsmany et al. (2001) believe that children who have fully functioning theory of mind but at the same time lack any storage system to temporarily store forms of items are not be able to consolidate the signs on account of the absence of memory. Moreover, they argue that the cornerstone of the basic assumptions about how working memory plays a role in learning new words is that one needs a working memory system in addition to his/her knowledge of the sounds' dual relationship to the world and to the mental state of the speaker.

5.5. Other Factors and Strategies

When children come across words they are not familiar with, they tend to rely on the strategies discussed by Clark (2003), according to which, the context in which children first encounter the new word plays a very important role in the meaning they assign to it and how they use it. That is, the first referent of a new term is typical or atypical. Moreover, Clark suggests that children should attend to a range of

exemplars, watch other speakers' uses of that term, and observe reactions to their own uses of the words.

Another suggestion she makes concerns what children tend to do before and after they map a new word onto a form. One of these tendencies of children pertains to locative relations presented in the prepositions *in, on*, and *under*. When we present children between 18 and 24 months old with objects such as boxes with different sizes, they consistently tend to place the smaller ones *inside* the bigger ones treating them as containers. Otherwise, they place it *on top of* anything that can be treated as a surface, such as a table. The author argues that once children learn the meanings of *in* and *on*, they should be able to make contrasting placements in response to the relevant preposition in an instruction.

Amongst the strategies implemented by children to deal with new meanings is their reliance on general conceptual preferences when dealing with differential amounts. Children tend to have conceptual preference for greater extension. According to Clark (2003), when children of three and four years old are presented with two piles of coins, where one is larger than the other, and they are asked to identify the one with *more* or the one with *less*; they tend to choose the larger pile. She notes that there are a number of other dimensions present in young children's conceptual preferences leading them to choose the entity that has the greater extension in length, width, or height before they establish the exact meanings of dimensional terms such as *tall-short*, *wide-narrow*, or *high-low*. To illustrate this, she provides an example mentioned in a study by Donaldson and Wales (1970) where children were asked to decide whether someone should climb the taller or the shorter tree in order to see something. Children consistently responded by opting for the entity with greater extension in width, height, and length. In the same study, Clark (2003) provides an

interesting example to show that children rely on their conceptual preferences before they work out the exact meanings of some dimensional terms. Children who were asked to "Point to the short plank" responded as if they were requested to "Choose the longer of the two planks".

6. Conclusion

The essence of this paper is the study of the processes that enable young children to rapidly come up with lexical representations for novel words- also known as fast mapping. The process is either performed by direct instruction from adult speakers to young children or via the inference of the young children of the meanings intended by the adults. I have also discussed how children carry out such tasks and what they need in order to accomplish this mission. Interestingly, children do not learn by observation only, nor by matching novel objects with phonological representations. Definitely, there is more to the complex, yet successful, execution. Undoubtedly, young children rely on some syntactic cues such as in the case of the verb "zike" and on their awareness of the mental states of other people. I have also discussed some of the factors that control young children's solutions to the mapping problems they encounter, such as the social interaction, the role of pragmatics and semantics, the role of working memory, and other factors and strategies that children tend to utilise before they work out the meanings of unfamiliar words.

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