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ORGANIZATION OF NOUN AND VERB CONCEPTS IN ENGLISH AMONG VISUALLY IMPAIRED AND SIGHTED PARTICIPANTS; A THEORETICAL PERSPECTIVE

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Abstract:

This paper highlights the theoretical aspect of how visually impaired (VI) and sighted learners (SL) in an ESL context understand, concepts of English Nouns and Verbs. The paper reports an investigation carried to identify how these students organize and represent conceptual knowledge, specifically knowledge of concrete and abstract concepts. This study is conducted with a view to gain insights into how the negotiations of such concepts from their prescribed course books. The investigation has been carried on to document if any existing differences in understanding and representing the conceptual knowledge in these students, any different. A word association task and a familiarity evaluation task was administered to 17 VI and 19 SL. The investigation results provide supporting data to discredit our major hypothesis that VI learners will have difficulties with abstract concepts. Instead we document no significant differences in their performance on concrete and abstract concepts. There is no significant difference among the VI and SL group in their performance on these concepts. However, conceptual knowledge is represented differently in both the groups. One group (VI) tends to organize information taxonomically, the other (SL) did this thematically and this is a significant difference.

The findings on concrete and abstract concepts lend support to the modality-specific theories of representation in grounded cognition (Barsalou, 1999, 2008) which suggest that information from various sources are integrated to form representations in the lexicon. Research with bilinguals has also shown that parental input has a role to play in the understanding and organization of concepts(Sheng & Lam, 2015).

Our second hypothesis that the performance on nouns would be better than that on verbs for both groups is not supported as well. Surprisingly, we find that both groups perform better on verbs but there is a significant difference between the two groups in this performance. The difference on taxonomic vs. thematic relations is significant as well. We suggest that this could be due to the nature of the verbs presented and also because information on abstract verbs rests largely on the syntactic and semantic frames in which they occur. Context availability and image ability could be two factors that affect their acquisition.

Key Words:
Concept Understanding, Concrete & Abstract Concepts, Grounded Cognition, Concept Classification & Categorization, Taxonomic & Thematic Organization, ESL Learners, Sighted and Visually Impaired, Learning Styles & Inclusive Practices.

Main Paper:

1.0 Introduction

Our knowledge of the physical matter around us helps us conceptualize information surrounding us. Most sighted individuals are constantly bombarded with overwhelming information compared to most other senses. The sighted are extremely dependant on sight to negotiate various tasks be it mobility, domestic or social, academic or professional, this continues from sunrises to sets. We began to identify the concept of an *Apple*by an adult producing the sound, and the objects' features by seeing its shape, color, the taste and many such features an object, a noun in this case possess. Over a period of time we gather more information and then frame a notion and begin to categorize such concepts either as an edible fruit. Are all such perceptual properties (shape, colour an estimate of size) available to a concept such as *Revenge* in a similar manner? Though the two words happen to be nouns one is concrete with distinct properties while the other possessing the properties of an abstract noun provides non perceivable features to recognize the noun, therefore both these nouns differs. How does one without sight differentiate and negotiate such concepts that are both perceivable and non-perceivable using the functional senses?

This paper reports and highlights the findings with theoretical framework within which abstract and concrete concept understanding in Sighted Learners (SL)and Visually Impaired (VI)learners might understand similar concepts in English (L2) when examined with existing literature. With attempt to extend this to explain how the absence of sight, do VI learners depend on their experiences of listening to language in various contexts, multiple situations and use it help them conceptualize? Or do they depend purely on 'perceptual' aspects and input provided by parents, siblings, peers teachers and others that they interact with to form their own construct of a particular concept? This would then suggest that a VI learner's representation of a concept would be very different from that of a SL. What kind of information do abstract and concrete concepts activate in VI learners when they hear a word? Is this information arranged taxonomically or thematically in the semantic lexicon? Can

knowledge of VI student's learning styles help the language teachers device a methodology to teach English to students with special needs?

1.1 What are concepts?

Our conceptual system contains *our knowledge of the world* and this most basic unit of understanding is a concept by itself. Concepts stored in long-term memory are crucial to cognition, they help us organize our experiences efficiently, but more importantly, they enable us to perform a range of cognitive tasks such as recognizing matter (objects), planning thought, language and actions, understanding metaphor, and making analogies and act as the interface between perception and action. They are integral components of word meaning as they provide "conceptual representations systematically linked to words, their meaningful parts, or constructions composed of several words" (Kiefer &Pulvermüller, 2012). Concept formation is dependent to a large extent on age, environment, language, and culture. They often have two levels of meaning – one that is common to or agreed upon by universally and the other which is very specific to the individual.

However, cognitive scientists are not agreed on what exactly constitutes a concept. From a referential perspective, there are two views: concepts could be viewed as either being independent of minds or as "causal relations between the world and mind" (Barsalou, 2003,p.84). The question that such theorists address is how mental states can refer to categories that exist outside the mind. Cognitive theorists, on the other hand, are more concerned with the relationship between mental states and categories, the structure and content of conceptual representations. The nature of conceptual representations too is under debate.

Popular constructs of concepts are that they are mental representations of objects or events. One school holds that the understanding of these representations depends on the sensory modality and life experience. They see concepts as being deeply grounded in perception and action (Barsalou, 2003; Lakoff&Johnson, 1999; Gallese&Lakoff, 2005). Others deny the role of perception and suggest that concepts are purely mental entities that are a result of reasoning. While some researchers hold that concepts are stable entities isolated from one another, others see them as being related to each other with no definite boundaries such that the activation of one concept activates various other concepts as well. These conceptual relations link up different concepts and of the manykinds of conceptual relations that are activated, taxonomic and thematic relations appear to playan important role in concept representation in the mind (Markman, 1989; Barsalou, 1993;Borghi&Caramelli, 2003; Caramelli, Setti, &Muarizzi, 2004). We take up the discussion of taxonomic and thematic relations later in this paper (see sec 1.5).

1.2 Concrete and Abstract concepts

Traditionally, concrete concepts "refer to entities that are perceivable and embedded in aspatial context" (Caramelli, Setti, Muarizzi, 2004) while abstract concepts "refer to entities that areneither neither purely physical nor spatially constrained" (Barsalou&Wiemer-

Hastings, 2005).Concrete items are structured around prototypical items, are distinct from one another and possess a graded structure. Since feature properties are central to category membership, one category is semantically distinguished from the other. As a result, concrete categories provide dimensions that enable us to reason out family membership. Categories are significant in that they enable us to use our knowledge in processes such as similarity judgments, classification, inferences and analogies.

Abstract concepts on the other hand, refer to abstract and complex entities, such as processes, events, mental experiences, stories, and relations which form a significant part of our daily experiences and actions. However, unlike concrete concepts which are perceivable and possess attributes such as shape, size, texture, abstract entities lack such physical qualities(e.g., anger, hunger, dedication), and there is no clearly defined criteria that allows us to categorize an entity as being abstract. Abstract concepts therefore cannot be perceived directly. They are most commonly used to describe situations or states. The common perception is that it is easy to differentiate between concrete and abstract concepts – one has 'physical' attributes while the other does not. This distinction is however not so clear-cut as it does not take into account the graded differences in concreteness. Take for instance, some of the words used in this study. The word ***Negro*** is more abstract than ***Award*** but both can be perceived. Similarly, ***Dedication*** is seen as more abstract than ***Violence*** but neither of these is physical entity that can be perceived. This variable concreteness has a direct effect on the processing of concrete and abstract concepts and is central to theories that attempt to explainconceptual representation.

1.2.1 Are abstracts harder to understand? Why?

It is often cited in the literature that abstract concepts pose greater difficulties than concrete concepts. Schwanenflugel (1991) found that while young children (first graders) hadlearnt almost all the concrete nouns used by adults while only older children (adolescents) hadmanaged to learn a large number of abstract nouns. Similarly, in reading, Yore and Ollila(1985) showed in children who were learning to read, abstract words posed more problems than concrete words. Abstract words were acquired later and they evidenced greater problems in reading abstract words in comparison to concrete words.

Further evidence comes from sentence verification and timed comprehension tasks. Studies examining the verification of concrete and abstract sentences have shown that concrete sentences are verified faster than abstract sentences (Jorgensen &Kintsch, 1973; Glass, Eddy &Schwanenflugel, 1980 cited in Schwanenflugel, 1991). While the results obtained appear to be infavour of a processing advantage for concretes over abstracts, other factors such as imagery, comprehensibility, semantic relation between the subject and predicate appear to have a role to play in determining this advantage. In experiments investigating the influence of concreteness on comprehension, mixed results have been found. This is due to differences in the experimental design employed – some studies requires

subjects to comprehend for later recall (Marschark,1979, cited in Schwanenflugel, 1991) while others required subjects to read passages and then

complete a multiple-choice task (Graesser, 1985, cited in Schwanenflugel, 1991).

Schwanenflugel & Shoben (1983) found that when subjects had to paraphrase isolated concreteand abstract sentences, comprehension times were longer for abstract than concrete sentences. While the picture that emerges from these studies is one of an advantage for concrete sentence comprehension, the definition of comprehension in the experiment appears to be crucial to the interpretation of findings.

The following discussion on three theories that have attempted to explain this differential processingof concrete and abstract words are – (i) *Dual-code theory*, (ii) *context availability* theory(Schwanenflugel&Shoben, 1983) and (iii) *contextual constraints theory* (Wiemer-Hastings,Krug &Xu, 2001).

1.2.1.1 Dual-code theory (DcT). One of the oldest theories that attempts to explain this asymmetry between concrete and abstract concepts is the dual-code theory advanced by Paivio(1986). According to this theory cognition rests on two separate subsystems, "a verbal system specialized for dealing directly with language and a nonverbal (imagery) system specialized for dealing with three artifacts' objects and events" (Paivio, 2006). Representational units call edogogens and imagine constitute these two systems and are activated when a person recognizes, thinks or manipulates words or things. "The representations are modality –specific, so that we have different logo gens and images corresponding to the visual, auditory, and haptic (feel), and motor properties of language and objects" (Paivio, 2006). On this theory, both systems are involved in language-related phenomena. According to DCT, concrete words or concepts have access to two codes, i.e., an imagery code, since they have concrete referents, and a linguistic code. The availability of a dual code nonverbal, pictorial and verbal – for representing and processing concrete concepts leads to their faster processing in many tasks, such as recall, word recognition and comprehension. The representation and processing of abstract concepts, on the other hand, rests purely on the linguistic code as it is more difficult to image abstract words. Studies have shown (Paivio, 1975;Paivio& Lambert, 1981) that this imagery code is more effective and stronger in recall tasks than the linguistic code.

1.2.1.2 Context availability theory (CaT). The context availability theory posited by(Schwanenflugel &Shoben, 1983) is another theory that attempts to explain why abstracts are processed slower than concretes. Critiquing the dual-code theory, the context availability theory claims that concrete words are not always more quickly understood than abstract words simply because of the imagery code that is available to concrete words. Studies conducted by Schwanenfugel and her colleagues (Schwanenflugel, Harnishfeger& Stowe, 1988;Schwanenflugel& Stowe, 1989; Schwanenfluge l&Shoben, 1983) have revealed that concreteverbal stimuli are not always processed faster and better than their abstract counterparts. Thesestudies appear to suggest that when abstract sentences are presented in the supportive context ofa paragraph, subjects did not take more time to read such sentences in

comparison to concrete sentences. Similarly, in a lexical decision task, subjects showed similar timings when concrete and abstract words were presented in a sentential context.

Schwanenflugel and her colleagues therefore advance a different explanation for the differential performance normally seen on concrete and abstract words. Their theory is based on context availability (Schwanenflugel&Shoben, 1983) and holds that for comprehension tooccur,"one must relate the to-be-comprehended materials to one's prior contextual knowledge in order to be able to make the interconnections between ideas that are needed for comprehension. Comprehension difficulties therefore emerge when the reader is unable or slow to relate the incoming message to his or her prior knowledge" (Schwanenflugel&Stowe, 1989).For this to happen, materials that are difficult to understand should be presented in a supportive context thereby making prior knowledge easily available and accessible to the reader.

On this view, lack of prior knowledge or difficulties in accessing it, in the absence of context, causes the reader to take longer while reading abstract words. Specifically, if the representation of concepts in long-term memory is viewed as a network of interrelated information, then difficulties in accessing prior knowledge, would lead to difficulty in word understanding. Contradicting dual-code theory which supports the sensory nature of the stimulus, this view holds that it is the availability of contextual clues that determines the difficulty with abstract words. This view is partially borne out in this study with our visually impaired grouper forming well on abstracts for which they are able to think of associated contexts andperforming poorly on those for which contexts appear to be unavailable to them.

1.2.1.3 Contextual constraints theory (CcT). According to the Contextual constraints theory(Wiemer-Hastings, Krug, Xu, 2001), abstract concepts are linked to contexts and they occur in situations (Schwanenflugel, 1991; Wiemer-Hastings &Graesser, 1998). For instance, an idea requires an agent and mental event, it will either verbally or in behavioral terms, can be evaluated. Ideas also possess a temporal dimension – one can think of an idea at a particular moment in time, express it in another, execute or even reject it at a later point in time. If looked at this way, abstract concepts are similar to verbs, i.e., "they are related to observable events in a situation, which are defined temporally" (Wiemer-Hastings, Krug, Xu, 2001).

The situation aspects that an abstract concept is dependent upon determine the number of contexts in which it can appear. If a larger number of specific situation elements are involved in its manifestations, then its occurrence becomes more constrained. Conversely, a concept that depends only on few situation features has a greater possibility of occurring in different situations. This suggests that a concept that is not very strongly constrained is likely to be more abstract than a concept that depends on a larger set of constraints. Moreover, if a concept occurs in the presence of concrete situation aspects, it is likely to be less abstract than concepts that depend on "abstract, or complex temporal elements of situations, or of information that is only accessible to introspection (such as a mental process)" (Wiemer-Hastings, Krug, Xu, 2001).According to this theory then, "it is not an aspect of the entity

itself that makes it abstract, but it is the abstractness of the constraints on situations in which it is used" (Wiemer-Hastings,Krug, Xu, 2001). The contextual constraints theory ties in with the context availability theory according to which abstract concepts are thus only because there is less context available in memory to process them. The contextual constraints theory explains this lack of sufficient context by positing that the more abstract the constraints on a concept are, the less we have with us to help us construct a mental context or what Barsalou (1999) calls a "simulation". The constraints are there but they leave open most aspects of the concrete context. If we take the word comparison, we find that it needs two entities to be present which have to be compared (this is the constraint). However, this constraint does not specify the nature of the two entities. Thus, we could be comparing people, animals, feelings, furniture and so on. On the other handicap less abstract entity, such as *departure*. This requires an agent, a movement or action and specific location that the agent moves away from. Here, the constraints involved are of a more concrete nature, and they can be used to simulate a reasonably concrete situation in which departure takes place. Constraints thus have a crucial role to play in the processing of abstract concepts. If as the context availability theory suggest, information has to be accessed to understand a concept, then constraints could serve to guide its mental construction. In this manner, they resemble schemata. Constraints could be of different kinds –agent characteristics, object attributes, concrete situation elements, relations, situation elements, and information about temporal characteristics and sequences (Wiemer-Hastings, Krug, Xu, 2001).

Spatial and temporal dimensions are crucial to abstract concepts. The temporal dimension is important because it tells us whether the concept is a state, a process or an event at a point-in-time. It also helps to sequence the events within a structure. The representation of many abstract concepts depends on information about time, cause, effect. For such are presentation, perceptual aspects beyond vision are integrated and this perhaps explain the large number of situation properties produced by our subjects for the abstract nouns presented to them Barsalou (1999). Information on situations percept could combine with introspective information to represent abstract concepts (Wiemer-Hastings &Graesser, 2000).

1.3 Theories of concept formation

The meanings of concepts are learnt by children in two ways – (i) direct exploration and manipulation and (ii) through reasoning. According to the maturational theory developed by Piaget in the 1920's and 30's concept development occurs in various stages at particular ages and is hierarchical in nature. This theory held sway for a long time in cognitive development but other theories attempting to explain concept development have come to dominate the field. Wenow review some popular theories and then go on discuss two that are current in the field ofcognition: embodied and grounded cognition.

1.3.1 Classical concept theory

Classical concept theory draws on the logic of Parmenides and Plato. It was further developed by Aristotle in the fourth century BCE. According to classical concept theory, "concept is a summary representation of some sets of things in terms of conditions that are

singly necessary and jointly sufficient for determining membership in that set" (Hjorland 2009). On the Classical view, concepts are represented in the mental lexicon as definitions. Concepts are defined in an all or nothing condition. Three laws, leading to mutual exclusivity, govern the

definition of a concept:

1. "the Law of Non-contradiction: Nothing can be both A and Not-A;
2. the Law of Identity: Whatever is A is A;
3. the Law of the Excluded Middle: Everything is either A or Not-A" (Olson 2007, 511).

As a result of mutual exclusivity, membership of a class is all or nothing. An object cannot partially be a member of two sets at the same time. It has to possess all the qualities required to be a member of a category or else it fails to belong to the category. The Classical view does not distinguish between the members of a category. An object that satisfies the definition is a "good" member while one that does not match the definition is a ''bad'' member. According to the Classical view the definition is the concept.

Classical theory's rigid view of concepts does not allow for the changing nature of social categories. In fact, in the Classical paradigm, definitions of concepts are isolated from context (Slaughter 1988). Frye (2005) insists that "social categories are not sets, and thinking of the massets is disastrous." In her view, social categories function without fixed and necessary boundaries or conditions. Thus, there is no absolute sameness that holds them together. Social sets have shifting and porous boundaries and are made up of a variety of members who are similar. Classical theory has been critiqued for its focus on mutual exclusivity and hierarchy.

1.3.2 Prototype theory

As Wittgenstein (1953) pointed out, it is almost impossible to specify the necessary and sufficient features for all the concepts we know of. While a "family resemblance" runs through the fabric of a concept, there are differences within categories. This resemblance is a "complicated network of similarities overlapping and crises-crossing, sometimes overall similarities, sometimes similarities in detail" (Wittgenstein, 1953). In his view, the abstract conceptualizations that classical theory provided were arbitrary and could not really differentiate the meaning of a word. In order to recognize how a word is to be used, what is required is context. Wittgenstein's ideas helped shape the Prototype theory proposed by Eleanor Rosch. Like the Classical theory, in Rosch's (1978) Prototype theory, category membership is determined through the possession of 'particular properties'. However, in contrast to the Classical view, in Prototype theory, the membership of a group does not require an item to possess all 'qualities'. Just the bare minimum qualities or features required for an item to belong to a category suffice on this view. Context or the conditions present at a particular moment are central to the meaning of a word or. On this view, qualities of a concept are not essential, they are incidental. A member of a group could possess all the typical features of the group; it would continue to be a member of the group even if it

possesses a few but not all the features of the group. Thus, concepts are defined "only in actual situations in which they function as participating parts of the situation rather than as either representations or as mechanisms for identifying options" (Rosch, 1999). Category membership is established by the presence of sufficient number of features that are typical of the class. By this definition, a prototype would be an "average" member of a group and is context dependent, i.e., it could vary across people and moments. It is thus possible for a concept to contain multiple prototypes. There is considerable disagreement in the field as to what constitutes concept representation on this view. Is it a set of feature lists? Feature lists appear to be inadequate ascertain features of an object may not be central to the membership f a category. For instance, the size of a bird such as a robin is not a determining factor in its membership of the category, birds.

Results from different types of experiments such as sentence verification, picture identification, typicality ratings land support to this theory of concept formation. The members of a category that get the highest rating are the ones that are named first and also produced the fastest. A recent perspective closely aligned with the prototype view is the use of schemata in the representation of concepts. "A schema is a structured representation that divides up the properties of an item into dimensions (usually called slots) and values on those dimensions (fillers of the slots)"(Murphy, 2002). Restrictions exist on what kinds of fillers can fit into the slots. For example, the colour of the head of a bird can be filled in only by colours. The number of fillers for a slot are viewed as competitors and the slots are interconnected as well by means of relations such that a particular piece of information restricts or determines another. For example, a flightless bird does not migrate. This would be represented as a relation between the locomotion slot and the migration slot. It is believed that schema helps in the organization and easy retrieval of information.

1.3.3 Exemplar Model

While the Prototype theory rests on the identification of a single prototype, the Exemplar theory, suggests that category knowledge can be represented by storing in memory as many known exemplars as possible of that particular category. Typicality is therefore one of the chief principles associated with the Exemplar theory. By this we mean that exemplars that share features or characteristics with other exemplars of that category are seen as typical. When a new item is encountered, it is compared against all other existing members and if it similar to the typical exemplar it belongs to that category. This comparison places demands on memory. The Exemplar theory can accommodate the graded nature of category membership as it posits that the more exemplars an item matches, the better it fits into a particular category. This theory shows that individuals use information about features that are correlated to decide whether a new item belongs to a particular category or not (Medin, 1982).

According to researchers, the increase in frequency of encounters with a particular stimulus will have a positive effect the typicality of an exemplar. Since this theory rests on memory of specific instances or experiences, more instances of a particular exemplar will be available in memory when a potential category member is encountered. E.g., since oranges an dapples are more frequently encountered, they are the most typical members of the category of fruits making them the ones that are recalled faster when asked for examples of fruits.

1.3.4 Relevance Theory

The Relevance theory draws upon Grice's central maxim that expressing and recognizing intentions is one of the most fundamental features of communication (Grice, 1989). According to Sperber and Wilson (1986), proponents of the Relevance theory, "communication exploits the well-known ability of humans to attribute intentions to each other". The main tenet of the Relevance theory is that "the expectations of relevance raised by an utterance are precise enough, and predictable enough, to guide the hearer towards the speaker's meaning" (Wilson &Sperber, (2002). According to the communicative principle of relevance and the definition of optimal relevance when addressing someone, a speaker communicates that his or her utterance irrelevant. These principles form the basis of an inferential theory of communication. A speaker's utterance carries with it a presupposition of optimal relevance and a hearer uses this presupposition to infer the speaker's intended meaning. On this theory inference of a speaker's meaning depends on the 'meta-representation' of the speaker's intention(s) in the listener. The relevance theory holds that people pay attention to information about concepts that are relevant to them and require minimum effort. Individuals differ in their entries for concepts which are based entirely on experience. An entry for a particular concept includes information about the extension and/or denotation of that given concept – a set of assumptions about the concept. Unlike logical entries which are constant, small and finite, encyclopedic entries are open-ended, i.e., new elements could be added to construct new assumptions about the world (Sperber& Wilson, 1986,b).

1.3.5. Embodied and grounded cognition

Embodied cognition is often seen as a research programmed that combines methods from a number of theoretical fields such as psychology, philosophy and neuroscience. The underlying assumption that unites insights drawn from all these fields is that "the body functions as constituent of the mind rather than a passive perceiver and actor serving the mind" (Leitan&Chaffey, 2014 p.3). Embodiment cognition has drawn heavily on the works of James and Eleanor Gibson in psychology specifically their theory of ecological psychology, Kant,Heidegger and Dewey in the field of philosophy. The different philosophical strands are now being integrated into more current theories of embodied cognition.

Two of the major philosophical schools that embodiment draws on are naturalism and phenomenology. According to this view, "all things in the world, including body and mind, are naturally emergent, as opposed to non-material" (Aikin, 2006 cited in Leitan& Chaffey,

2014p.4). According to naturalism, cognition emerges and evolves from the relationship between the organism and the environment. Higher cognitive activity such as perception, bodily movement, object manipulation and feelings are generated as a result of the interaction between the body and the world. The primary focus of phenomenology is experiential meaning and therefore it gives importance to subjective experience, i.e., an individual's experience of his/her own cognition.

While it may be argued that phenomenology has no role to play in analyzing the biological constitution of an individual, phenomenologist's argue that it understanding subjective experience serves as a useful basis for naturalistic inquiries. These combined perspectives serve to form holistic approach to cognition.

An important theory integrating these two perspectives is the "ecological theory"(Gibson, 1979) which holds that "perception is direct and that the environment is meaningful"(Leitan& Chaffey, 2014 p.4). According to Gibson, direct sensorial contact between the individual and the environment led to perception. Thus, if perception were to guide action in the absence of a mediating "mind", then the environment had to contain enough information for this. Such meaningful environmental information was termed 'affordances'. This refers to opportunities for action provided by the environment. The ecological theory rejects the division between action and perception, physical and mental capacities. With this idea forming its central theme, embodied cognition investigates the link between "mind and body, perception and action, doing and thinking" Leitan& Chaffey, 2014 p.5).

Since embodied cognition is seen as more of a research programme combining different accounts, it is hard to define. What do we find in the literature however, are different accounts of embodied cognition? Shapiro (2007) identifies three: (i) replacement, (ii) conceptualization,(iii) and constitution.

1.3.5.1 Replacement and dynamic systems. This theory combines ideas from the computational model used in cognitive science and the dynamical systems theory used in mathematics. In this view of embodied cognition, cognition as a process involves three aspects–mind, body, and the world. These work as an ever-changing system which can be mathematically described. Dynamic systems are characterized by two main features: (i) emergence and (ii) coupling.

The notion of 'emergence' is that there is no predefined rule that governs the behavior of parts which results in the formation of new outcomes. Instead, the parts self-organize or coordinate to form new outcomes in accordance with the constraints and opportunities made available to them by the environment.

'Coupling' happens when the parts of a system include a term to describe the other parts within the system. In other words, each component in a system is in relation to other parts of the system. The different parts of the system and the system as a whole, change over time.

One of the most well-known instances of the dynamic systems model as applied in cognition, is the re-interpretation of Piaget's A-not-B error experiment advancing "object permanence". According to this model, a set of embodied processes guides the child'sbehaviour and not the representation of the object in the child's mind. It is argued that what Piaget called "object permanence" was the process by which the child learnt to overcome the habit of reaching to location A. Furthermore, when environmental changes were made, the error was eliminated. (Smith & Thelen, 2003). Therefore it was suggested that the A-not-B error experiment was better explained and understood as a coupled process between the child and theobject.

1.3.5.2 Constitution and Extended Mind. This account of embodied cognition is concerned with "what" constitutes cognition. According to this account, cognitive processing occurs not only in the brain (mind), but also in the body and in the world (Shapiro, 2011).The extended mind account, gained popularity in the late 20th century. Its proponents Andy Clark and David Chalmers theorize that that the mind extends beyond the brain and the body into the world around it (Clark & Chalmers, 1998). This view posits that "the world is in fact a constituent of cognition" (Leitan& Chaffey, 2014 p.6). This suggests the world is as much a constituent of cognition as the body. If the world is used to perform function (which would-be considered cognition if it happened in the mind) then it would be a part of cognition.

Clark and Chalmers (1998) demonstrated this in an experiment involving a normal person with intact memory and a person with Alzheimer's disease. Both of them listened to information about an exhibition on art at a museum they'd both visited. While the normal person was able to recall the location of the museum from memory, the person with Alzheimer's required the help of a notebook to retrieve this information. The notebook according to Clark and Chalmers is as much a part of cognition for the person with Alzheimer's as neural memory is for the normal person.

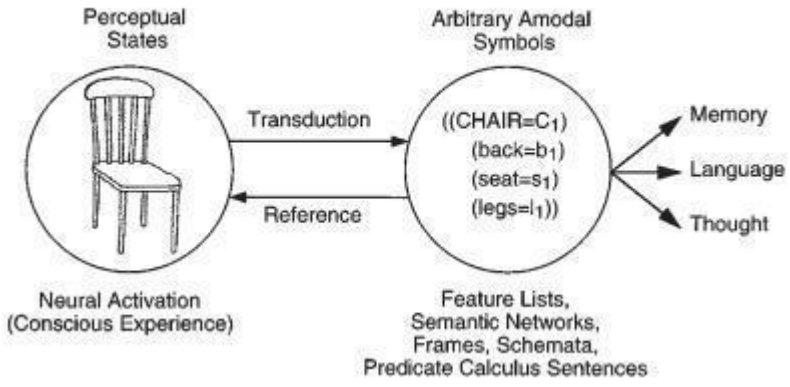
1.3.5.3 Conceptualization and Grounded Cognition. How do individuals form constructs of the world based on their experience? This is the question that the conceptualization and grounded cognition account seeks to address. The experiences of an individual are to some extent determined by the body (Shapiro, 2011) and this assumption forms the basis of the various grounded cognition accounts. The two main ideas underlying grounded cognition are: (i) cognition involves interaction between the body and the world, and (ii) representations of these interactions are stored in the brain (Lakoff& Johnson,1999; Barsalou, 1999, 2008). Various strands of grounded cognition theories differ in how they view the representation of these interactions in the bran. While some theories view these representations "image schemas" (Lakoff& Johnson, 1999) while others view them as an "experiential system" which includes emotion, introspective, sensor motor and proprioceptive systems. Representations of the bodily experiences are then "simulated" during cognition(Barsalou, 1999; Gallese&Lakoff, 2005). Over the last twenty years, there has been increasing empirical support for this view of cognition (Barsalou, 2008).As the grounded cognition theory forms

the basic framework within which our study is located, we discuss this in a little more detail in the following subsection.

1.4 Grounded cognition

Over the last decade, there has been an increasing interest in the deeply interconnected relations between abstract or higher order operations like language use, planning and reasoning and relatively concrete lower order cognitive skills of the sensory-motor systems that enable moving, seeing, feeling, and manipulating. Work in this area, termed grounded cognition supports the claim that thinking is intertwined with – grounded in –perception and action. Different researchers describe this grounding as "grounding language action" Glenberg and Kaschak (2002); "grounding conceptual knowledge in modality-specific systems" "grounding cognition in perception" and of "grounded cognition" (1999; (Barsalou et al., 2003; Barsalou,2008).

The representation and understanding of abstract concepts has been the focus of increased attention in cognition. Grounded cognition approaches hold that sensor motor experiences are crucial to concept understanding. Information from the sensor motor systems are stored indifferent areas in the brain, i.e., visual, auditory, and motor. This information is activated when people directly experience the world. This is in contrast to standard theories of cognition which view knowledge as residing in a semantic memory system that is separate from the modal perceptual systems located in the brain. Traditional theories of cognition view thought as being purely symbolic. According to these symbolic or a modal theories, perception and cognition are two fundamentally distinct processes and symbolic representations are independent of sensory experiences. Once encoded into meaningful syntactic structures, the perceptual information from which these structures originated is not retained. Thus the internal representation is not only purely symbolic, but the relationship that exists between the perceptual input and the internal representation is completely arbitrary. Proponents of the a modal theory (Pylyshyn, 1984;Fodor,1975) posit that the key feature of cognition is the computations that can be carried out onsymbolic representations.



Representation of chair on the a modal symbol system (Barsalou, 1999 p.579) From the figure, it is clear that the word chair and the a modal symbol for chair no bearnosimilarity to chairs as we perceive them. If modal symbols are connected to other amodalsymbols, both of which are arbitrary, where do they derive their meaning from? By what processor mechanism is perceptual information transducer into a symbol system? These are the key questions that modal systems are unable to address satisfactorily.

In attempt to address these questions, grounded cognition theorists have proposed that modal representations are crucial to knowledge and place emphasis on bodily states, situated action and simulation. Lakoff and Johnson (1980) suggested that "abstract concepts are grounded metaphorically in embodied and situated knowledge" (Barsalou 2008, p. 621) e.g., happy is pandas is down. Cross-linguistic evidence shows that abstract concepts are often discussed in terms of concrete metaphors. Other theories of cognition suggest that situated action, i.e., the environment hasa key role to play in cognition. On the situated action view, different systems carry out perception, action, and cognition and each of these systems can reside in myriad states.

Barsalou (1999, 2008) proposed the Perceptual Symbol System (PSS) in which conceptual knowledge is represented in modal systems in the brain, i.e., "cognition is typically grounded in multiple ways, including simulations, situated action, and, on occasion, bodily states" (Barsalou, 2008). On the PSS view,

"a perceptual state can contain two components: an unconscious neural representation of physical input, and an optional conscious experience. Once a perceptual state arises, asubset of it is extracted via selective attention and stored permanently in long-term memory. On later retrievals, this perceptual memory can function symbolically, standing for referents in the world, and entering into symbol manipulation" (Barsalou(1999 p.584).

Perceptual symbols thus collected and developed give rise to the representations underlying cognition. In contrast to traditional views, these symbols are modal because the systems in which they are represented and the perceptual states which produced them are the same. Thus, perception and cognition are served by a common representational system. By virtue of being modal, perceptual symbols are analogical. There is some degree of correspondence between the structure of perceptual symbol and the state which produced it (Barsalou, 1999).

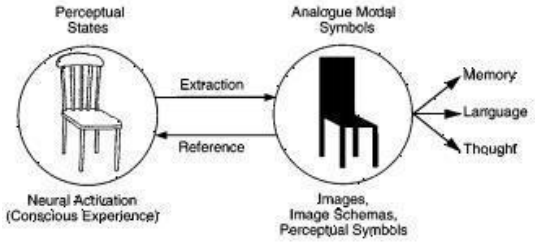


Figure 3. Perceptual symbol system representation for chair (Barsalou, 1999 p.578)According to Barsalou (1999) the following properties characterize a conceptual systemi) perceptual symbols are neural representations the brain, (ii) these symbol represent only schema-related parts of perceptual experience, (iii) they are multimodal, (iv) symbols that are related combine to form numerous simulations of a perceptual component, (v) symbols in a simulator are organized by frames and (v) and language associated with simulators helps construct and organize simulations. We discuss each of these below. Perceptual symbols are "...records of the neural states that underlie perception. During perception, systems of neurons in sensory-motor regions of the brain capture information about perceived events in the environment and in the body" (Barsalou, 1999 p.582). At this point, only qualitative and functional information is represented. A perceptual symbol thins perspective is seen as a record of the activation that ensues in the process of perception. Perceptual symbols are primarily grounded in the sensory-motor system.

As mentioned earlier, a perceptual symbol is not a record of a complete perceptual state. Only a part of a state that is relevant to a particular situation, i.e., a schematic aspect, is represented. When perception occurs, an individual pays attention to that aspect which incoherent and meaningful. Other aspects while not completely ignored may only receive partial attention. Once this is done, this particular aspect is then stored in long-term memory and helps in the formation of meaning and structure of a concept. Since the perceptual symbol is product of a neural network, it is dynamic and its activation patterns vary across contexts. As information is added, patterns of activations alter even more. Thus, the symbol varies depending on the context.

The perceptual symbol formation process is independent of sensory modalities, i.e., modalities of sight, sound, touch, feel, taste, proprioception and introspection. Aspects of experiences are selectively focused on and then stored in long-term memory. In this way perceptual symbols are multi-modal and integrate information from all modes of experience. They are distributed in modality-specific regions of the brain (Barsalou, 2008).Symbols that are related to one another are organized into a simulator. Thus simulations for an entity or event are constructed. For example, when looking at a car from one side, information about the doors, windows and wheels is selected and organized spatially. A similar process is repeated when it is observed from the front and the back. This information is then organized to develop a complete simulation of a car so that a coherent simulation for it is available later in its absence. The symbols formed are organized into a frame. An individual thus stores a variety of multimodal simulations for the frame car.

To sum up, the simulation account (Barsalou, 1999, 2008) addresses the issue of representing abstract concepts through the use of simulators which are developed by focusing attention selectively on particular aspects of an entity during perception. In this manner an individual can develop a number of simulators for perceived objects, relation, actions, feelings, states. When an entity is encountered, these simulators along with their linguistic counterparts form representations for it.

1.5 Taxonomic and thematic relations

On the grounded cognition framework of concepts, and abstract concepts in particular, are not isolated, standalone units. They are linked by a neural network of relations and are connected to a variety of other concepts. The activation of one concept leads to the activation of several others. Of the different types of relations among concepts, two are considered crucial to conceptual organization: (i) taxonomic and (ii) thematic relations. Concepts are considered to be taxonomically organized when there is a hierarchical arrangement between them. A concept is linked taxonomically to a higher level (super ordinate)or a lower level (subordinate) concept. E.g., if we take 'dog' as a concept, then the super ordinate category is 'animal and the subordinate level are 'Pomeranian'. 'Cat' is seen as a coordinate level concept as dog as both belong to the super ordinate level of 'animal'. Super ordinate and subordinate relations possess a vertical structure, while coordinate relations possess a horizontal structure. Properties shared by concepts at a higher level are more inclusive and can be transferred to lower level concepts but not the other way round. Concepts are said to be thematically related when the links made are across knowledge domains. Situations and events are the common thematic links. These include spatial and temporal relations as well as object and agent relations. E.g., the concept 'chair' evokes the thematic link 'comfortable', 'grandfather', 'cane'.

Studies examining the organization of concepts have reported conflicting results. Young children have been shown to organize concepts thematically before they do so taxonomically (Lucariello& Nelson, 1985; Nelson, 1986; Mandler, 1992). This rests on the assumption that the environment – actions and events – that children take part in are central to knowledge organization in the early stages of development. At later stages, as more knowledge is acquired, information disorganized thematically. This suggests that during development, thematic relations help children to acquire abstract hierarchical relations. This thematic – to – taxonomic shift, called the 'cognitive economy principle' helps them to organize information gathered from the environment effectively. Cognitive development on this view entails the transition from contextual knowledge derived from direct experience of the properties of events and objects, to more abstract knowledge built nonhierarchical relations that help group events and objects into categories (Lucariello& Nelson,1985; Lucariello, Kyratzis& Nelson, 1992). Researchers have however suggested that conceptual knowledge is both situated and context driven (Tschacher&Scheier, 1999). While different objects can be perceived in the same spatial context, it is also possible to perceive thesame object in different spatial contexts (Barsalou&Prinz, 1997; Barsalou, 1999; Barsalou&Hale, 1993). This has led to the idea of a shift being questioned and many recent studies have shown that young children are also capable of organizing information taxonomically (Lin &Murphy, 2001; Caramelli, Setti&Muarizzi, 2004; Borghi& Caramelli, 2003; Borgi&Caramelli, 2001).Researchers have suggested that the task type influences the production of thematic or taxonomicrelations (Waxman &Kosowsky, 1990; Waxman

&Namy, 1997). It is also widely suggested that thematic relations play a role in conceptual organization in older children and adults(Markman, 1989).

1.6 Concept development in children

In their early years, children attempt to understand the world around them at two levels☹i) a micro level of object categories encountered in daily experience, and (ii) a macro level that some term commonsense "theories". The first, i.e., categorization, is closely connected to the vocabulary acquisition of children. As the vocabulary expands, children also learn to identify the objects whose names they have learnt as belonging to certain categories and that they have certain features. For instance, a child who learns to identify a peacock also gathers information that it belongs to the category of birds, and that it is flightless. Similarly, children also acquire knowledge about events, causes and results of such events. Children often extend this category knowledge to objects or experiences that are new or unknown. In an experiment conducted by Gelman and Coley (1990), children as young as two and a half years showed the ability to base inferences on category membership even though the surface appearance of the objects presented in the experiment was conflicting. Sometimes however, this extension can also lead to wrong or very broad based inferences, which in the literature is, referred to as stereotyping. Children often resort to stereotyping when they try to organize complex information on the basis of their limited experience. Factors that affect concept development are emotional attitude, attention span, interest and environment. An environment that constrains the kind of stimulus available to a child is likely to hinder concept formation. In the next section, we look at some of the theories that have been influential in attempting to explain concept development.

1.6.1 The noun advantage

What kinds of words do children learn first? This information is critical in understanding how information is organized into concepts. If the categorization of words is learnt and not innate, there are two ways in which this might happen: (i) "cognitive dominance [in which] concepts arise from the cognitive-perceptual sphere and are simply named by language" and second ... linguistic dominance [in which] the world presents perceptual bits whose clumping is not pre-ordained, and language has a say in how the bitsget conflated into concepts" (Gentner&Boroditsky, 2001 p.215). According to Gentner&Boroditsky (2001), both kinds of dominance are important, but the degree of this importance depends on the kinds of words. Some experiences combine naturally to form concepts while others can combine in myriad ways.Gentner suggests that this division of dominance (Gentner 1988) is evident in English inwhat are traditional described as closed class (prepositions, determiners, conjunctions) and open class (nouns, verbs, adjectives) categories. Closed class words perform grammatical functions while open class words perform denotation functions.

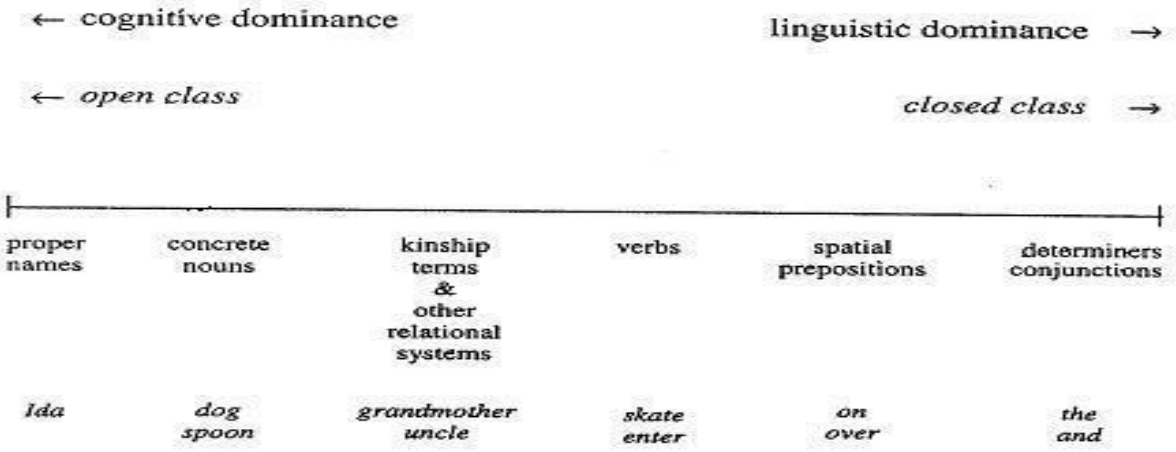


Figure 4. Division of dominance (Gentner &Boroditsky, 2001 p.216)While the distinction between closed-and open class categories has always been viewed as a dichotomy, Gentner (1988) views it as a continuum with preposition and verbs somewhere in-between nouns and closed class words. "...verbs and prepositions perform relational functions ...they are linguistically embedded: their meanings are invented or shaped by language to a greater degree than is the case for concrete nouns."(Gentner &Boroditsky, 2001 p.216)Nouns are stand for entities that can be understood on the basis of perceptual experience and so are characterized by cognitive-perceptual dominance. Determiners and conjunctions are characterized by linguistic dominance. Their meaning is derived from and depends on language. Prepositions and verbs which lie in the middle of the spectrum, have a denotation function. The relations and events they denote are mediated via language.

Gentner (1982) explains the appearance of nouns before verbs in the lexicon of children using two the natural partitions and relational relativity hypotheses.

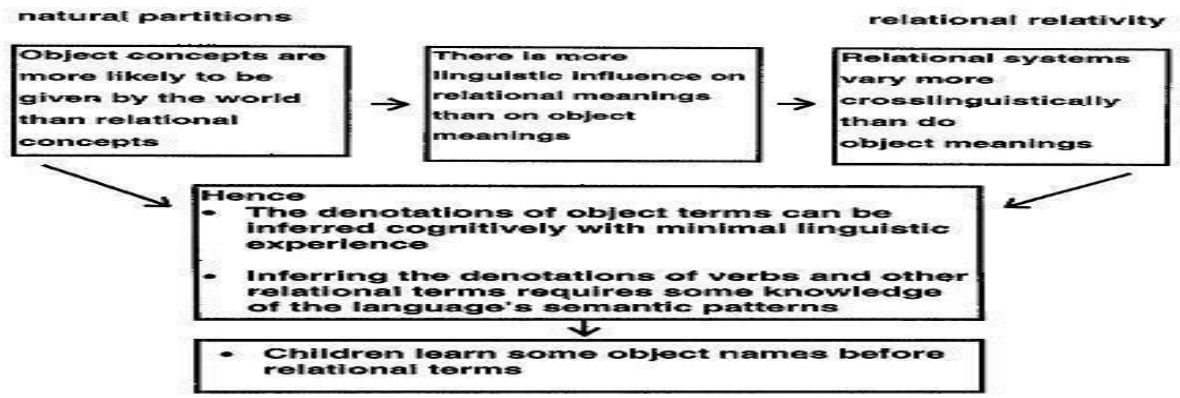


Figure 5. Natural partitions and relational relativity ((Gentner&Borditsky, 2001 p.217)According to the natural partitions hypothesis, "there are in the experiential flow certain highly cohesive collections of percept's that are universally conceptualized as objects, and these tend to be lexicalized as nouns across languages. Children learning language have already isolated these cohesive packages – the concrete objects and individuals – from their surroundings" (Gentner&Borditsky, 2001; Gentner&Borditsky, 2009). On this hypothesis, the first concepts to be learnt are those that have representations that are inter-related. According to the relational relativity hypothesis, "when we lexicalize the perceptual world, the assignment of relational terms is more variable cross-linguistically than that of nominal terms. Predicates show a more variable mapping from concepts to words. A language has more degrees of freedom in lexicalizing relations between coherent objects than in lexicalizing the objects themselves. Thus, for verbs and other relational terms, children must discover how their language combines and lexicalizes the elements of the perceptual field"(Gentner&Borditsky, 2001 p.218).

This means that for verbs, children have to first learn how their language allows verbs and other closed class categories combine. Differences in the patterns of meanings for verbs another closed class terms exist across languages and a child has to learn which pattern applies for the language (s) he is learning. This variability does not occur on concrete nouns, which have stable meanings across languages. They can be perceived as wholes and refer to concrete objects thereby making it easy for children to acquire. Verbs, in contrast lie further down on the division of dominance scale, and their meanings are language dependant. Thus until some language is acquired, their meaning cannot be understood. Their acquisition therefore happens later through bootstrapping, i.e., noun-object pairs serve as bootstraps or helping mechanisms in the acquisition of these items. Cross-linguistic evidence in support of the noun advantage comes from studies in a variety of languages such as Hebrew (Dromi, 1987),Mandarin (Gelman&Tardif, 1998), Korean(Gopnik& Choi 1990) and Italian (Caselli, Bates, Casadio, Fenson,Fenson, Sanded, & Weir, 1995).

1.7 Word learning in sighted and visually impaired children

Language learning in sighted children is known to appear in the form of single words as early as 11 months. These are largely nouns that describe simple objects present in the child's environment. Between the ages of 1-2 years children are well on their way to acquiring language with sentences beginning to appear in a very rudimentary form. Though their sentences may be short they display knowledge of how nouns and verbs combine to convey meaning and once longer utterances begin to appear by age three, and by five, children are able to slot nouns and verbs into their respective positions within a sentence to convey the intended meaning. The role of environment and maturational state are two factors that play an important role in the acquisition of language and to what extent and how well it is acquired.

However, in a visually impaired child, this onset could be delayed. Landau showed that blind children begin to utter their first words approximately between 23 – 26 months

(Landau, 1997). In another study, Norris, Spaulding, & Brodie (1957) showed that in blind subjects first words appear at 15 months while longer utterances appear at 24 months. This is later than the norms for sighted children for these two stages which is 11 and 16 months. The literature on concept development in blind children is inconclusive. In Klein's (1819)view, blind children cannot conceptualize about colors. They understand only those concepts that can be explored haptically. According to him, blind children are unable to differentiate between all centric and egocentric reality. Similarly, Cuts forth (1932) suggested that blind children produce words that are semantically empty. In his view, their language is meaningless as they do not have access to visual stimuli which is crucial to understanding. Dokecki (1966) holds that visual experience cannot be the determining factor of language learning. In the absence of direct experience in the form of sight, it is possible for the blind to learn or acquire conceptual meaning through verbal descriptions. This view is supported by Landau &Gleitman (1985), Gleitman& Newport (1995) and Gleitman (1990) as we shall see in the following section.

1.7.1 Observation and Learning: the problem

In Locke's (1690) view, which has been a long-standing one in language learning, in order to make children understand words, we show them the object, tell them the name of this particular object until they are able to associate the object with its name. i.e., if we show a child 'cup', 'crow', 'red', 'yellow' and shirt' then the child will learn these words and associate them with the objects described. The child who has seen the object and has heard its name a number of times, is then 'somehow' able to extend this knowledge to other instantiations of the same. For instance, a child who has seen Tommy and Blackie while hearing the sound 'dog', will soon be able to use the word 'dog' to refer to Brownie. Thus, while a child's initial input consists of a sound-situation pairing, the final outcome is a form-meaning pairing. But how is the child able to make these connections and make generalizations to a larger infinite set based on input from amore restricted finite set?

The answer to this according to Locke lies in the fact that the sighted child is constantly exposed to objects, events and scenes as they listen to spoken language. However, the relationship between these objects scenes and events and their 'meanings' is not always direct or one to one as they can be described in a number of different ways. This is because language can encode a number of descriptions for a given situation. For instance, Tommy is an object, a mammal and a dog. When a sighted child sees and hears the word dog, he could also interpret this experience as brown, soft, frightening, four legs, and whiskers. When the dog is asleep on a mat, then the experience 'the dog is on the mat', is 'the mat is under the dog', 'the dog and mat are on the floor' are equally relevant. How does a child make a distinction between one encoding and another and know which one relevant to that particular scene. If there are breakdowns in how this experience is encoded, people would misunderstand one another and communication would fail.

Another aspect of word learning that poses a challenge to Locke's view is the acquisition of meaning of abstract concepts, i.e., concepts that do not have concrete referents

in the environment and that are more abstract in nature. Many of the words that are learnt easily by young children cannot be experienced directly through the sensory or perceptual modalities. E.g. children can understand the meaning of prepositions such as 'in front of' or 'in' due to the embodied nature of such concepts. However, more abstract but often used concepts such as 'good', 'same', 'very', 'pet' encode information that is not entirely tangible or physical in nature. Neither can they be experienced nor are they easily observable. But children do not appear to have any difficulty in acquiring or understanding these concepts. Thus it appears that experience alone cannot form the basis for learning.

Landau &Gleitman (1985) examined Locke's view that while sighted and blind children would be able to learn the meanings of concrete words 'statue' and 'sweet', blind children would be unable to acquire abstract terms like 'see' and 'red'. They examined blind children's understanding of the words that describe visual experience such as 'look' and 'see'. One expectation with regard to such words is that they would perhaps be absent from the vocabulary of blind children given that visual seeing and looking is not an experience available to them. However, 'look' and 'see' are among the earliest verbs that appear in the spontaneous speech of these children. And these are not semantically empty either. For instance, when asked to "Lookup!" they raise their hands possibly because for them 'looking' is a perceptual operation performed by the hand. Even more interesting is the fact that they distinguish between 'look' and 'touch'. When told that she could touch a table but not look at it, the blind child in the experiment gingerly tapped the table. However, when she was told that they could look at it, then she went on to explore all its surfaces systematically using her hands. Similarly, when talking about colors, blind children showed as much knowledge as sighted children about vision-concepts. They identified it as an attribute of a physical object and were certain it could not be used for abstract notions such as ideas. While this might seem surprising, a fact remains that there are differences in how both populations interpret these terms. This difference is an obvious and expected one which could be attributed to the differences in the environmental in which a word is used. Evidence from the fields of linguistics and neuroscience appear to suggest that there exist close similarities between the representation of concepts in visually impaired and sighted individuals and that this depends on the ability of the visually impaired to build rich and extensive representations of the world by combining linguistic and sensory information that is not dependant on vision. However, the picture is not very clear.

1.8 Concept representation in sighted and visually impaired children

The study is informed by findings on concept representation in both sighted and visually impaired learners. Three studies with sighted learners which served as the basis for our study were those conducted by Borghi &Caramelli (2001),Caramelli, Setti& Muarizzi, (2004)and Caramelli&Borghi (2003). In these studies a word association task was used with young children ranging between 5 to 8 years of age to determine whether there was a thematic to taxonomic shift in young children and at what age this shift occurred. These

studies also attempted to find out if there were any observed differences between concrete and abstract concepts and if they produced different types of relations.

The findings from these studies suggest that there is no real thematic to taxonomic shift. At all ages, children produced both kinds of relations and they seemed to produce more thematic relations. Comparing concrete and abstract concepts, the Caramelli, Setti& Muarizzi, (2004)study found that concrete concepts elicited a large number of thematic relations. Of these, attributive relations conveying information about the perceptual properties of objects seemed to form the largest category. Abstract concepts, on the other hand, did not appear to elicit many taxonomic responses. They were characterized largely by context-related information about the events, in which they occurred, i.e., they elicited situational information to a large extent. This is in line with findings from other studies such as Wiemer-Hastings et al. (2003).Studies with blind children (Stephens &Grube, 1982; Miller, 1985) show that some concepts are acquired by blind children only at a symbolic level and that they have difficulties in tasks such as problem-solving. Demott (1972) finds that no differences exist in the meaning of words in blind and sighted children. Similarly, Millar (1994) and Piskorska (2008) show that blind children do not show any difficulties in understanding concepts. In fact, Millar showed that blind children were comparable to sighted children in a colour recognition task. Moreover, the former responded faster than the latter to auditory, spatial and visual stimuli. Assessing the aesthetic judgments of blind children, Piskorska (2008) showed that visual concepts do not pose major problems for blind children. Other studies too have shown that blind children are not very different from sighted children. In their 2005 study, Rosel, Caballer, Jara& Oliver show that blind children possess arich and wide vocabulary, and that their use of sight bound expressions is comparable to sighted children. Landau and Gleitman (1985) finding that blind children possess a deep knowledge ofcolours is supported by by Perez-Pereira & Conti-Ramsden (1999).Landau and Gleitman (1985),suggest however, that blind children's understanding of colour words may be qualitatively different from that of sighted counterparts.

In another study with blind children, Jaworska-Biskup (2011) examined concept understanding in a group of congenitally blind and sighted children. She administered a free association task to children between the ages of 7 and 9. The concepts included in that study were categorized into four groups –colours, nature phenomena, features of living organisms and physical processes Jaworska-Biskup (2011). The study revealed that the sighted children produced predominantly vision-based and symbolic responses while the blind children showed a different pattern. While they did reveal knowledge of symbolic meaning, they resorted to analogical reasoning to explain the similarity between the concepts and their explanations of these concepts. Overall, it was seen that the absence of sight was compensated for by other senses and that syntactic and semantic cues were crucial in aiding concept representation. The study also showed that they were in no way retarded in conceptual development and that the mental lexicon possessed a wide range of "visual

perceptions, stereotypes, symbolic and emotive associations and metaphors" (Jaworska-Biskup, 2011).

These findings largely from L1 contexts reveal that visually impaired children understand and organize concepts in ways that are similar to sighted children. These findings prompted us to investigate whether this held for similar populations in an ESL context. This led the need to investigate and examine concrete and abstract concept understanding, in visually impaired and sighted children in Hyderabad, India.

1.9 Classifications and Categories

Taxonomic categories: (C). A category in the taxonomy to which a concept belongs.

Synonym: e.g., car–AUTOMOBILE; cat–FELINE.

Super ordinate: e.g., car–VEHICLE; apple–FRUIT.

Coordinate: e.g., apple–ORANGE; oak– ELM.

Individual: e.g., car–MY CAR; house–MY PARENTS' HOUSE.

Antonym: e.g., jetsam – FLOTSAM

Thematic Categories: A category in the taxonomy to which a concept belongs.

Entity properties (E). Properties of a concrete entity, either animate or inanimate. Besides being a single self-contained object, an entity can be a coherent collection of objects, or an institution, if it consists of at least some concrete entities (e.g., forest, government, and society).

Larger whole: e.g., window–HOUSE; apple–TREE.

Spatial relation: e.g., car–window ABOVE door; watermelon–green OUTSIDE.

External surface property: e.g., watermelon–OVAL; apple–RED; car–STINKS.

Systemic property: e.g., cat–ALIVE; dolphin–INTELLIGENT; car–FAST.

Entity behaviour: e.g., dog–BARKS; children–PLAY.

Situation properties (S) A property of a situation, where a situation typically includes one or more participants, at some place and time, engaging in an event, with one or more entities (e.g., picnic, conversation, vacation, and meal).

Location: e.g., car–IN THE GARAGE; buy–IN A STORE.

Action: e.g., shirt–WORN; apple-EATEN.

Associated entity: e.g., watermelon–TABLE; cat–LITTER.

Function: e.g., car–TRANSPORTION; clothing–PROTECTION.

Manner: e.g., watermelon–SLOPPY eating; car–FASTER than walking

Event: e.g., watermelon– PICNIC, car–TRIP.

State of the world: e.g., mountains–DAMP; highway–CONGESTED.

Introspective properties: (I). A property of a participant's mental state as he or she views a situation, or a property of a participant's mental state in a situation.

Affect/emotion: e.g., magic–a sense of EXCITEMENT; vacation–I was HAPPY; smashed car–ANGER.

Evaluation: e.g., apples–I LIKE them; vacation–I wrote a STUPID.

Representational state: e.g., smashed car–believed it was not working; cut tree–wanted to cut it down.
Cognitive operation: e.g., watermelon–I REMEMBER a picnic.
Contingency: e.g., car– REQUIRES gas; tree–has leaves DEPENDING ON the type of tree.
Negation: An explicit mention of the absence of something, with the absence requiring a mental state that represents the opposite (e.g., car–NO air conditioning, apple–NOT an orange).
Miscellaneous: Information in a protocol not of theoretical interest.

1.10 Analysis of the data

Data for the study was generated using the prescribed book by the Board of Secondary School to all the schools established within the State of Telangana. A total of 54 tokens were identified consisting both concrete (23) and abstract (31) concepts from a unit (*Icon of Civil Rights*) from the English Language Textbook. These tokens were administered to two groups of English as Second Language learners. Members of Group A are Visually impaired and Group B are sighted participants. The test was an adaptation of the Caramelli, Setti, &Maurizzi (2004) study which was conducted with children aged 5, 8, and 10, and adults. Participants were presented with concept nouns at super ordinate, basic, and subordinate levels and their productions were coded according to 4 kinds of relations: taxonomic, thematic, attributive, and evaluative relations.

Findings of the study in an ESL context reveal that there is no significant differences between the two groups. However, when we look at the two types of concepts across the groups, we find that the patterns of conceptual knowledge representation appear to be different. For both concrete and abstract concepts, we find that the VI group arranges information taxonomically while the SL group arranges this thematically (Figure 2), this will be discussed shortly.

The presence of Abstract and Concrete concepts in textbooks accompanied by individual notions prompted questions such as

1. How do VI learners understand abstract and concrete concepts?
2. Are abstract concepts e.g., mental states, emotions, more difficult for VI learners than concrete concepts?
3. Is abstract and concrete concept understanding in VI learners different from that of sighted learners?
4. In what way is the organization of conceptual knowledge in VI learners different from or similar to sighted learners?

The hypothesis derived from these questions are:

1. **Concrete vs. Abstract concepts**
    - For both groups, performance on concrete concepts is expected to be better than that on abstract concepts. This is because concrete concepts "refer to perceivable and spatially embeddedentities" (Caramelli, Setti, Muarizzi, 2004). Abstract concepts on the other hand, "refer to entities that are neither

purely physical nor spatially constrained" (Barsalou&Wiemer-Hastings, 2005).

Sighted participants by virtue of their ability to see allows them to access the world around them and perceive concrete objects in the shortest possible time to perform better on concrete concepts than VI learners. Sight, for the group B participants, is the primary source of information in addition to other sources be it mobility, accessibility and many more. Visually impaired learners on the other hand, have no access to visual stimulus and therefore depend on tactile, auditory and linguistic information to be able to generate the concept of a specific object.

With regard to abstract concepts, we expect the two groups to perform similarly because abstract concepts such as colours,mental states, emotions, attributes of living organisms, derive meaning from the linguistic contexts in which they appear. Thus, abstract concepts such as *accept, believe*, are not perceivable and are often use to describe situations.

1 (a) Taxonomic vs. Thematic relations

The expectation that both groups (A & B) will produce taxonomic and thematic relations for the concrete and abstract concepts presented to them proved to complement with the results of the study at hand. With the findings in the existing literature, it is expected to find more thematic relations than taxonomic relations with both groups of learners for concrete and abstract concepts.

2. Nouns vs. Verbs

The performance on nouns is expected to be better than that on verbs with both groups. This is due to the existence of concrete referents with Nouns along with stable denotations across languages and cultures therefore are learnt easily. Verbs on the other hand, depend on semantic conflation patterns which are language specific. Learning these requires a certain amount of language understanding and so verbs are acquired later, partly through bootstrapping (GentnerBoroditsky, 2001)

SLs are likely to show better performance than VI learners on both nouns and verbs. Though visual perception may be a disadvantage to VI learners, they will be able to collect information about concrete objects through other modalities such as tactile and kinaesthetic modalities. Grounded cognition theories (Barsalou, 2003, 2003a, 2008) hold that the body, environment, situations, and simulations in the modal systems of the brain combine to form representations for concepts. This should help VI learners to generate knowledge representations for concepts through different modalities even though the primary modality of sight is absent.

2 (a) Taxonomic vs. Thematic relations

We expect that both groups will produce taxonomic and thematic relations for the noun and verb concepts presented to them. In line with findings in the literature, we expect once again, to find more thematic relations than taxonomic relations for both groups of learners.

Documented Test Results:

The following figure is a graphical representation of performance from both groups A & B.

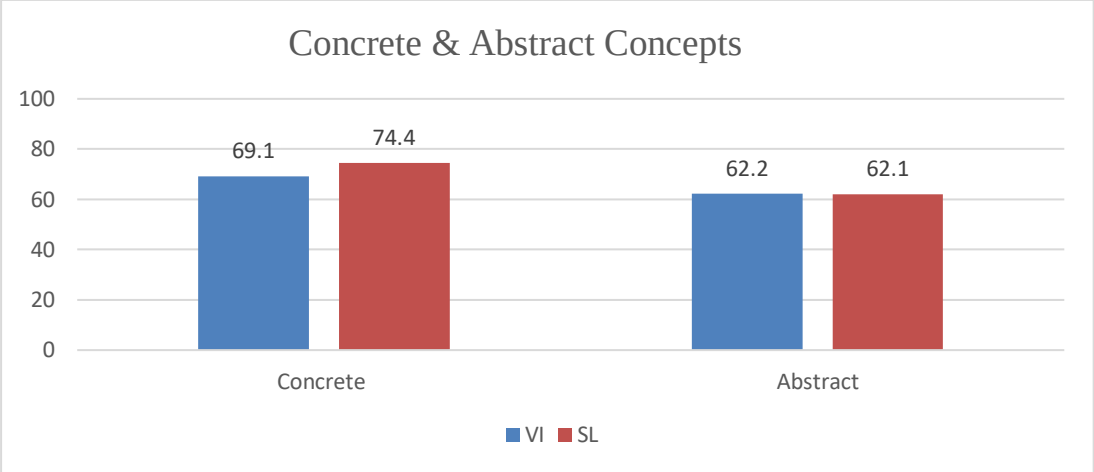


Figure1. GroupA& B scores on concrete and abstract concepts (in %)

Consider the above graph for the result on concrete and abstract concepts of both Nouns and Verbs from both the groups. With Concrete items that refer to perceivable and spatially embedded entities" (Caramelli, Setti, Muarizzi, 2004), it is evident that the sighted students did not perform as expected considering the advantage of sight, therefore the access to reading materials and various interactions with peers, teachers and elders at home.

Consider the fact that the concepts were extracted from a unit "Icon of Civil Rights"in the prescribed text book. Both the groups were not taught this unit by their language teachers. The reason for choosing such a unit is

A. it is a western context, a concept that is alien to the participants due the National, Geographical, Political and Time bound factors that influence the context in which Civil Rights here are being discussed in the unit. The Unit presents factual information on the Ideology and contributions of lateDr. Martin Luther King Jr., during the 1950s – 60s.
B. To document if the participants will use these concepts presented to them in a different context that is familiar to them.

The sighted participants (group B), despite having access to the text books much before the schools reopen for the new academic year, did not perform as we expected. On the other hand the visually impaired participants (group A), with an added disadvantage managed to perform equally well along with the group B students. Group A's performance on Concrete nouns and verbs documented 69.1% whereas group B performance documented 74.4%. Considering the facts mentioned earlier in points A & B, sighted learners associated concepts thematically whereas the visually impaired associated majority of the concepts taxonomically.

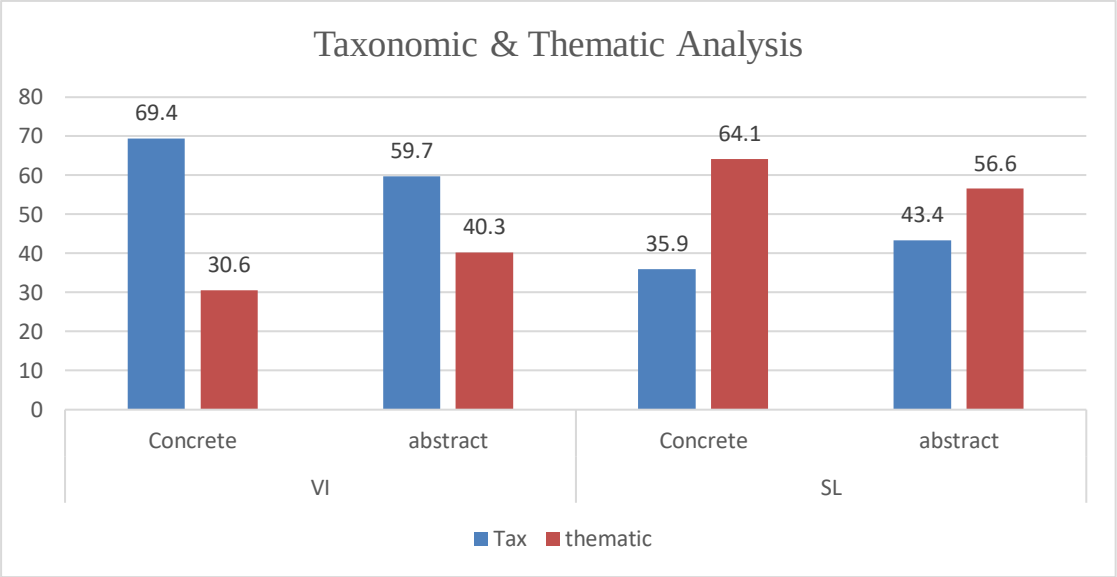


Figure 2. Groups' scores on Taxonomic & Thematic Categorization

The evidence provided here in the graph shows group A (on the left hand side of the figure above) associated concrete and abstract concepts more taxonomically than thematically. Whereas the Group B (on the right hand side of the figure above) participants associated concepts of both Concrete and Abstract more with thematic association than taxonomically. This evidence provides us with an understanding of how visually impaired participants organize information using all the cognitive faculties in hierarchical terms. This is because thematic links require a larger network of associations between different domains of Knowledge, i.e., the events and situations in which these concepts occur and how they link with each other. Though the group A participants were able to integrate information from various sources, perhaps the network of associations comparatively are not as rich and varied enough to afford a wide range of thematic relations. Wherever contexts are available to afford the formation of such relations, our subjects have been able to produce thematic relations as evidenced by the higher percentage of 'situation properties'.

The graph also shows that abstract concepts elicit more thematic relations than concrete concepts. As mentioned earlier, the reason for this could be that abstract concepts depend largely on the linguistic context, specifically, the syntactic and semantic context, for their acquisition (Quine, 1960; Wiemer-Hastings, 1998; Schwanenflugel&Shoben, 1983). Abstract concepts are bounded by situation and convey information on the contexts and events in which they occur rather than the taxonomic category they belong to.

Consistent with findings in Wiemer-Hastings &Xu (2005), we find that within thematic relations the percentage of entity properties for abstract concepts (1.6%) is much lower than that for concrete concepts (35.5%). Situation properties were also elicited for both concrete and abstract concepts. It is worth noting that situation properties elicited the highest percentage of thematic relations for both concrete (50.4%) and abstract concepts (67.2%) respectively. Within the sub-category of situation properties, 'state of the world' makes up

for the largest number of responses. This suggests that Situation properties are relational properties, which describe the item's relations to other entities in context, such as animate beings, physical and social states, functions, and locations.

Another possible explanation for this could come from the ESL context within which this study is located. In studies examining young normally developing bilingual children, categorization skills have been shown to be stronger than in monolinguals since bilingual shave to organize a larger number of words and do this regularly across the two languages that they use. Studies examining category knowledge in young bilinguals (Sheng & Lam, 2015; Peña, Bedore, &Zlatic-Giunta, 2002; Nelson & Nelson, 1990; Yu & Nelson, 1993; Nanjappa, Sebastian &Deepa, 2016) have shown that taxonomic knowledge emerges earlier in bilinguals and that they use it to help them organize and access information effectively. Sheng, McGregor, & Marian (2006), found that Mandarin-English bilinguals responded more frequently to taxonomic relations in comparison to monolinguals. These studies also suggest that categorization abilities of bilinguals vary because of the influence of cultural and linguistic factors.

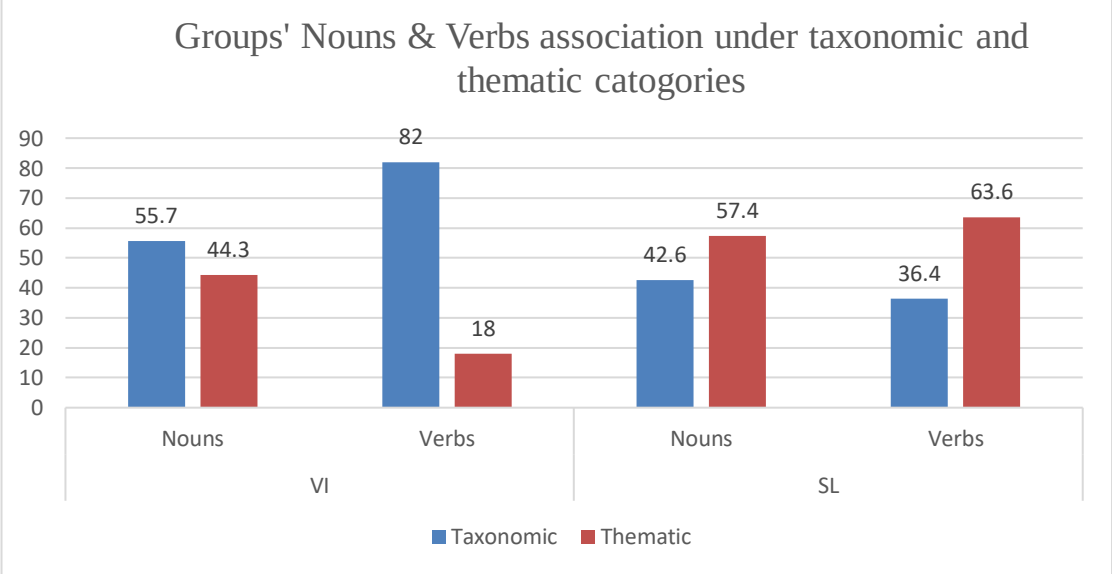


Figure 3:

As is evident from Fig.3 the left side of the figure shows the group A scores, both noun and verb concepts elicit taxonomic and thematic relations supporting our hypothesis. Mirroring the pattern observed for concrete and abstract concepts, here too there are a larger percentage of taxonomic relations than thematic relations for nouns and verbs.

Of the 64% of the coded response for nouns, taxonomic relations account for 55.7% while thematic relations account for 44.3%. This difference between taxonomic and thematic relations for nouns is not considered to be statistically significant ($p = 0.1296$, $t = 1.5557$, $df = 32$). On verbs however, of the 67.8% of responses coded, taxonomic relations account for 82% while thematic account for just 18%. A t-test to determine the difference returned a p value < 0.0001 ($t = 7.8811$, $df = 32$) which is considered extremely statistically significant.

This difference could be attributed to image ability and context availability. A similar finding is reported in Wiemer-Hastings &Xu, (2005), in which abstract items elicited slightly more taxonomic properties than concrete items even though the difference was only slightly significant. The verbs presented such as grinding, crying, opened, orbit are those that have greater image ability and are used regularly in daily conversation. Besides, these verbs also involve actions and are therefore more 'perceptual' for the VI group who can integrate information about these actions from other modalities such as artefacts, tactile and linguistic even though the modality of vision is absent. Table 9 presents the sub-categorization of nouns and verbs.

As is evident on the right hand side of the figure above showing the scores of group B participants, noun and verb concepts elicit both taxonomic and thematic relations supporting our hypothesis. Once again, we notice that the pattern observed for concrete and abstract concepts, is evident here too – a larger percentage of thematic than taxonomic relations are elicited for nouns and verbs.

Of the 60.2% of the coded response for nouns, thematic relations account for 57.4% while taxonomic relations account for 42.6%. This difference between thematic and taxonomic relations for nouns is not considered to be statistically significant ($p = 0.1296$, $t = 1.5557$, $df = 32$). On verbs however, of the 79.6% of responses coded, thematic relations account for 63.6% while taxonomic account for 36.4%. A t-test to determine the difference returned a p value = 0.0047 ($t = 3.0132$, $df = 36$) which is considered to be very statistically significant.

Once again, this difference could be explained by the availability of linguistic context, i.e., syntactic and semantic context, and image ability. The verbs presented such as grinding, crying, opened, orbit are those that have greater image ability and are used regularly in daily conversation. Besides, these verbs also involve actions and are perceptual as well enabling the SL group to integrate information about these actions from various modalities. In addition, the linguistic context provides crucial information about the situation thereby helping the learner to identify the referents of the concepts in question. Given that abstract concepts require knowledge of relevant situations to be in place, we believe that for SLs such situations are readily available.

1.11 Summary of results

The first major question we were interested in addressing was whether abstract concepts are more difficult for VI learners than concrete concepts. Therefore we hypothesized that performance on concrete concepts is expected to be better than that on abstract concepts. Our results clearly show that VI learners perform equally well on concrete and abstract concepts. We had also hypothesized that the SL group would show a better performance on concrete concepts given the advantage that perceptual knowledge (vision) gives them. Interestingly, we found that this group too did not show a difference in their performance on concrete and abstract concepts. The most significant finding of this study was that a comparison between the two groups on concrete and abstract concepts revealed no

significant group differences. This suggests that VI learners understand abstract concepts as well as their sighted counterparts. This finding is in line with the grounded cognition accounts which hold information from different sources such visual, sensorimotor, auditory, tactile sources as well as proprioception and introspection are stored as multi-modal simulations which are later recalled when the entity is encountered in a different context. It is also in line with the contextual constraints theory according to which the abstractness of a concept is dependent on abstractness of the constraints imposed on them. We suggest that for the abstract concepts, in particular the abstract verbs presented, the constraints imposed were more concrete in nature and that our learners had access to prior context and situation which enabled them to produce responses to these items.

Our minor hypothesis emerging from our first major hypothesis that both groups will produce taxonomic and thematic relations supports similar findings in the literature Lin & Murphy, 2001; Caramelli, Setti&Muarizzi, 2004; Borghi&Caramelli, 2003). We did not find any evidence for a taxonomic to thematic shift. However, we do find certain differences in concept representation in the two groups. VI learners produce more taxonomic relations while their sighted peers produce more thematic relations. We believe there may be two reasons for this: studies with young bilinguals have revealed that dealing with two languages tends to promote taxonomic organization of concepts. Also, parental input has a role to play in that parents often provide greater information on the categories that things belong to rather than themes associated with them (Sheng & Lam, 2015; Nanjappa, Sebastian &Deepa, 2016; Peña, Bedore, &Zlatic-Giunta, 2002).

Our second hypothesis was that the performance on nouns will be better than that on verbs, given that nouns are acquired first and have concrete referents. Our data from both groups do not support this hypothesis with performance on verbs being better than that on nouns with this difference reaching significance for the VI group. This we feel is due to an artefact of testing where the nouns presented were largely those that were unfamiliar to the learners. This was reflected in the familiarity ratings obtained for the nouns. Though contrary to expectations, these results fit in well with the situated cognition and contextual constraints account that are part of the grounded cognition view. As the learners did not have any prior information to relate the items to and also since the constraints placed on the nouns were more abstract in nature, the performance on these items was comparatively low. The pattern of VI learners producing more taxonomic than thematic relations and the reverse in the case of SL holds good here too. Between group differences are taxonomic and thematic relations are also significant.

Evidently results show that while VI learners understand abstract concepts as well as concrete concepts and do not differ from sighted learners, the manner in which they represent this knowledge is different. The qualitative differences between the two groups would be worth researching in.

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