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UNDERSTANDING CONCEPTS OF VISUALLY IMPAIRED IN ENGLISH AS A SECOND LANGUAGE CONTEXT

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Abstract:

The study investigates how visually impaired (VI) learners in an ESL context understand and represent conceptual knowledge, specifically knowledge of concrete and abstract concepts. This is done with a view to gain insights into how they negotiate such concepts which are found in plenty in their course books. The absence of such data regarding the understanding of such concepts in sighted learners (SL) in an ESL context, and in order to examine whether VI students understand and represent conceptual knowledge was vastly different from that of SLs, a group of sighted learners was included in the study. In order to address the research questions and to test our hypotheses, we administered a word association task and a familiarity evaluation task to visually impaired and sighted learners. Our major hypothesis that VI learners would have difficulties with abstract concepts does not find support. Instead, we found that there is no significant difference in their performance on concrete and abstract concepts. In fact, there has not been any significant difference documented between the VI and SL group in their performance on these concepts. There is one interesting concept to note, however, is that conceptual knowledge is represented differently in the two groups. While VI learners tend to organize information taxonomically, the SL group does this thematically and this difference is significant. Our 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). In our context this could be provided by such input could have come from the teacher who (from our observation of a lesson during the pilot (phase) provided detailed information about different concepts. Detailed interviews with parents and teachers would have enabled us to gather greater details about the quality and quantity of input provided to VI learners. Our second hypothesis that the performance of nouns would be better than that on verbs for

both groups is also not supported. Surprisingly, we found out that both groups perform better on verbs but there has been a significant difference between the two groups in their performance. The difference in taxonomic vs. thematic relations was significant as well. We suggest that this would be due to the nature of the verbs presented and also because of information on abstract verbs rests largely on the syntactic and semantic frames in which they occur. Context availability and imageability could have been two factors that affect their acquisition.

Keywords: visually impaired (VI) learners, ESL context, concrete and abstract concepts, word, association task, and a familiarity evaluation task, organize information,taxonomically, thematically

1.0 Background of the study

The study has its origins in an earlier study by the principal investigator's (PI)M. Phil dissertation which attempted to make the language textbook more accessible to visually impaired (VI)learners who have been mainstreamed in regular classrooms (Varma, 2011). Observation sessions in the classroom showed that the part of the lesson being taught on a particular day was recorded by VI learners as the teacher or their classmate read the lesson aloud. At the end of the day, the recording was erased so that space was available on the tape/device for the following day's lesson. Some of the VI learners committed to memory all that they had heard. These students did not engage with or complete any of the exercises or activities presented at the end of the lesson from the course book. As a result, their motivation levels were extremely low.

In order to address the issue of making teaching/learning materials to VI learners, to help them participate in classroom activities and to enable them to engage more fruitfully in the learning process, three lessons from the English textbook for Class 8 used by schools affiliated to the Andhra Pradesh State Board syllabus were modified. The modification was carried out by presenting the textbook units (Lessons) in an audio format (in the form of Mp3 files) to eleven visually impaired students (completely blind and partially sighted) enrolled in nine mainstream schools. The tasks and activities presented at the end of the unit were adapted so as to facilitate the self-reliant participation of the visually impaired group. As audio recorded versions of the lessons were provided, the students had access to the audio-text at all times and could listen to it as many times as they wished to at home and at school. Response sheets in Braille and large-print answer sheets were provided to encourage participation. The study revealed that the target group performed better when they were provided with necessary support using advancements in print media and audio technology (Varma& Raman, 2014). They were able to complete all the activities independently and participated wholeheartedly in classroom activities and discussions.

While the study achieved its aim of making materials more accessible, it also provided with a number of other issues which continue to confront visually impaired learners in mainstream classrooms. Firstly, the ratio of sighted learners to visually impaired learners in mainstream classrooms is approximately 35:1. This was evident in the earlier research conducted where the researcher had to visit 9 schools to locate 12 VI learners. Other problems faced by these learners include The course book's design: there is no Braille adapted version of the textbook available for them and very often they rely on memory to recall what has been taught.
Teaching methodology: teachers are trained to teach sighted learners and do not have the wherewithal to address the special needs of VI learners.

Examination procedures: while these learners are provided with scribes for examinations, they are either administrative staff or younger students who are not equipped to meet the needs of these learners. As the students pointed out, the scribes are often unable to write down what they dictate. Institutional constraints: schools do not possess the necessary infrastructure that makes for ease of mobility. One limitation of the study was its inability to address the vocabulary activities at the end of the unit. One of the reasons for this was that many of the words used in these exercises were abstract nouns and verbs. Initially, we did not have any information on how these are processed or understood by VI learners. Given the limited scope of the study, we could not get information from teachers or parents as to how they taught or explained such terms to their learners or children.

1.2 The Study
The limitation mentioned above led to the investigation of the study which set out to understand how VI learners understand lessons that are rich in visual, emotional and experiential content, i.e., lessons that contain concrete and abstract nouns and verbs as our analysis of the textbook showed during observation the teaching of the first unit, Swami is expelled from school, we identified the unit Icon of Civil Rights which was the 8thunit in the textbook. Swami is expelled from school is a unit that is set in the Indian context and is therefore in some ways the concepts present in this unit were familiar to students. On the other hand, the unit, An Icon of Civil Rights based on the life of Martin Luther King was seen as a suitable unit for identifying items for the study for the following reasons: it is set in a western context and therefore contained concepts that are unfamiliar to the learners. a number of concrete and abstract concepts were present in this unit.it had not yet been taught in the class.This gave us the opportunity to explore and study how VI learners would negotiate concrete and abstract concepts present in the textbook but may not have been explicitly taught.

In a recent study on the difficulties of VI students studying in the same school, Saradhi (2016)analyzed the textbook in use at the time and found that it contained a number of abstract concepts which could pose difficulties for these students. Our interests lied in finding

out how the teacher's and peer's input in L1and L2 helped these learners negotiate such concepts. To this end, we decided to observe the classroom as a first step. We chose to work with our previous sample who were now in Class 9.

In order to continue working with VI learners, a conscious decision was made to work with children enrolled in Devnar, a special school for the blind in Hyderabad. Our population in this study, therefore, consists of 18 Class 9 students studying in English medium school affiliated to the Andhra Pradesh State Board of Education (SSC). Beginning work with this sample was not easy for two reasons: as it is a special school, the researcher was not familiar with the teaching methodology employed by the teacher. He, therefore, spent a few sessions observing and recording (with the help of a video camera) the teaching of an entire unit in order to understand how the teacher tackled concrete and abstract concepts in class and how the learners negotiated them.

The State Government had just revamped and revised the syllabus and there was a delay in getting Braille textbooks ready for the learners. Moreover, the teachers and students had to complete the syllabus as prescribed by the Government within the stipulated time frame as examinations would be conducted on the basis of the new syllabus. This meant that we had to wait until the target group had some time to familiarize themselves with the new textbook before we could initiate the study. Concurrent with our attempts to locate our sample population, we came across findings from the current research literature on abstract and concrete concept understanding which showed that:sighted children find abstract concepts more difficult to understand than concrete concepts (Schwanenflugel, 1991).abstract and concrete concepts activate thematic, taxonomic and attributive relations in sighted children (Caramelli, Setti&Maurizzi, 2004; Barsalou and Wiemer-Hastings, 2005). visually impaired children show difficulties or delays in the proper understanding of abstract and concrete concepts as a result of limited hands-on experience due to blindness (Jaworska-Biskup, 2011; Preisler, 1995; Klein, 1819; Anderson et.al,1984).

These findings with sighted and visually impaired learners in an L1 context prompted us to examine concrete and abstract concept understanding in visually impairedESL learners who use language textbooks designed largely keeping sighted learners in mind and therefore abound in such concepts which are easily accessible to the latter. The best of our knowledge, little or no research has been done on how sighted learners negotiate such concepts in an ESL context. We decided, therefore, to include a group of sighted learners from Class 9 studying in an English medium school. We believe this comparison is necessary for us to make valid statements about the ability visually impaired learners to understand and negotiate concrete and abstract concepts as they appear in the learning material presented to them. This information would also provide us with valuable insights into teaching methodology and how the policy of inclusive education can be turned into reality.

This study reports the findings from a word association task (The Task) and familiarity scale task administered to 17 Visually Impaired (V) learners and 19 SightedLearners (SL) of Class 9 studying in schools affiliated to the Andhra Pradesh StateBoard. Our main hypothesis is that visually impaired learners will have great difficulties understanding concrete and abstract concepts than sighted learners as evinced through the word association task. We also examine the embodied and grounded view of concept formation, why abstract concepts are harder to understand, and the types of relationships that concrete and abstract concepts elicit. The results are computed for the two groups and are documented in a detailed analysis of the types of relationships that the task elicits. One surprising finding is that contrary to our assumption and common perception visually impaired learners are as good as sighted learners in understanding concrete and abstract concepts. This is in support of the findings that blind children are able to understand concepts as well as sighted children (Rosel, et. al., 2005).

1.3 The Task
The task used in this study is an adaptation of the Caramelli, Setti, &Maurizzi (2004) study. Participants have presented with concept nouns at superordinate, basic, and subordinate levels and their productions were coded according to four kinds of relations: taxonomic, thematic, attributive, and evaluative relations. However, the concepts presented to our target group were extracted from a unit of the prescribed language course book. Thus, a list of 54 concepts was identified from the unit An Icon of Civil Rights for the word association and familiarity evaluation tasks. Among the identified words 23 were concrete and 31 were abstract concepts. Of the 23 concrete concepts, 13 were nouns and 10 were verbs. Of the 31 abstract concepts, 23were nouns and 8 were verbs. As mentioned earlier, the choice of concepts and their distribution across the categories of concrete and abstract, nouns and verbs were determined by their presence in the unit under study. Consider the following as a sample:

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1	*2*	*3*	*4*	*5*	*6*	*7*

Never Heard or Used (NHU)   *Most often Heard/Most often used*

1.4 Task Administration
Phase I
The task was presented to the two groups in their classrooms within the regular school hours. The task was printed on an A4 sheet for sighted students. For VI learners, it was printed in braille. The instructions were read out by the researcher and all doubts were clarified before

the task began for both groups. The researcher explained the task to the students using English and if doubts persisted the L1, Telugu was used so that unfamiliarity with the task type would not affect task performance. Student completed the task individually. Students completed the task individually. For the VI learners, the researcher also read out each item thrice and spelled it out so that there would be no confusion. Our initial endeavor was to administer the task to VI learners individually. Due to institutional constraints, however, we could not do so. Therefore, the task was administered to the whole class. Students were given two minutes to write their responses for each item and they were told that they could generate as many responses as they could think of. The task began with concrete nouns followed by abstract nouns concluding with verbs.

The data gathered from the sighted sample was first coded and then tabulated by the researcher. TheBraille data gathered from the VI learners was transcribed by Ms.ShireenIraani, a research scholar attending EFL university Hyderabad who is a fluent user of Braille. This was then coded and tabulated by the researcher, and another Ph.D. scholar familiar with the coding criteria. The coded transcripts were verified by Dr. M.G. Raman, an Asst. Professor at EFL-U, Hyderabad.

The coding criteria adopted in this study is based on that developed by Wu and Barsalou (2009). We would like to point out that the categorization criteria had to be adapted to include the sub-categoryAntonyms, in the category of Taxonomic responses. This is because the items presented elicited such responses from our learners and do not find a place in the Wu and Barsalou (2009) classification.

1.5 Analysis of Data and Discussion
Our first major hypothesis was that performance on concrete concepts is expected to be better than that on abstract concepts for both groups. For both groups, we find that there is no significant difference in the performance of concrete and abstract concepts. Our expectation was that SLs will do better on concrete concepts than the VI group, while both groups will be comparable to abstract concepts. In accordance with our minor hypothesis 1(a) regarding taxonomic and thematic relations for concrete and abstract concepts, we find that VI and SL groups produce both types of relations. A close examination of our data shows certain fine distinctions between the two groups on the two types of concepts.

For concrete and abstract concepts, VI learners produce more taxonomic relations than thematic relations and this difference is significant.SL learners produce significantly more thematic relations for concrete concepts. Though they produce more thematic relations for abstracts, this does not approach significance. Our second hypothesis was that the performance on nouns would be better than that on verbs for both groups. Contrary to our

expectation, we find that both groups perform better on verbs than on nouns. While this difference is significant for the VI group, there is no significant difference for the SL group. Our minor hypothesis 2(a) regarding taxonomic and thematic relations for noun and verb concepts is supported by our data. We find that VI and SL groups produce both types of relations. Once again, a pattern similar to that on concrete and abstract concepts emerges here as well.

VI learners produce more taxonomic than thematic relations for nouns but this is not significant. For verb concepts, where we find a large number of taxonomic relations, the difference is significant. For the SL group, we find that the pattern of performance is reversed, with thematic relations being higher than taxonomic relations for noun and verb concepts. While the difference between thematic and taxonomic is not significant for nouns, we find that the difference is significant for verbs.
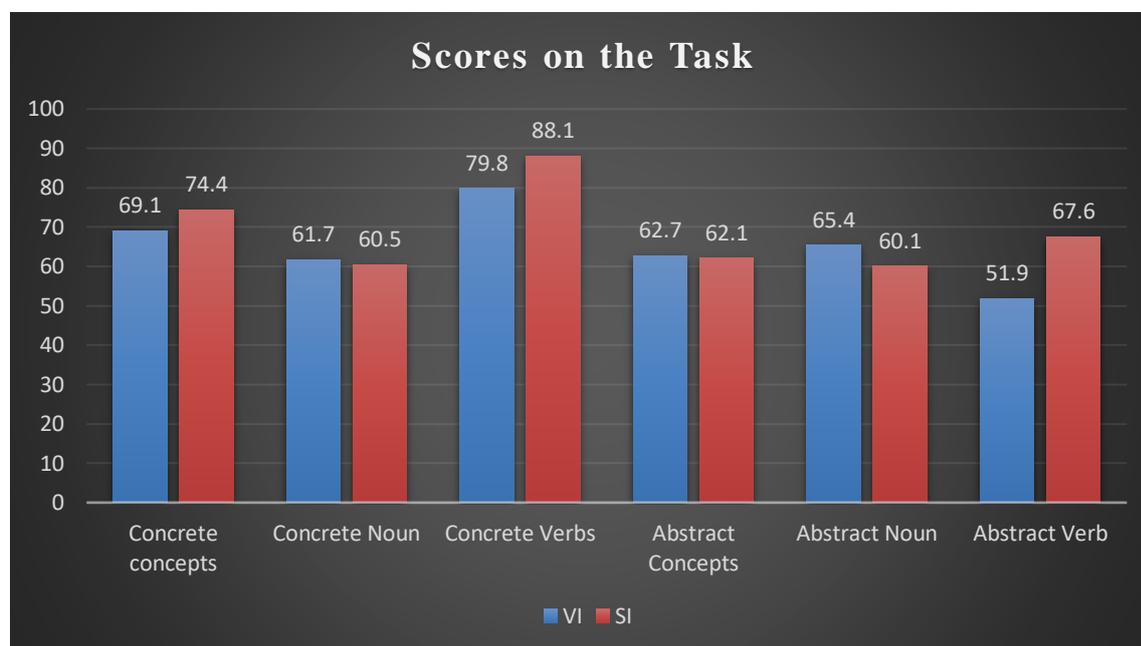
Table: 1

The group's scores on the task in percentages

Learner Group	Concrete Concepts	Abstract Concepts
VI	69.1 cn.61.7 cv. 79.8	62.7 a 65.4 av 51.9
SL	74.4 on 60.5 cv 88.1	62.1 a 60.1 av 67.6

Note: the figure in bold indicates the overall score obtained by collapsing across the categories of concrete and abstract nouns and verbs. Fig.1 represents this graphically.

Figure: 1

1.5.1 VI Group

Concrete vs. Abstract

Recall that 23 Concrete concepts (13 nouns and 10 verbs) and 31 Abstract concepts (23 nouns and 8 verbs) were presented to the learners in the word association task. The VI group produced a total of 1314 responses for concrete and abstract concepts presented to them. A total of 857 responses were coded as correct according to the Wu and Barsalou (2009) coding criteria adopted in this study (see Appendix A for a full description of the sub-categorization). Of this, 395 tokens were for concrete concepts and 462 tokens for abstract concepts. As the main aim of this study is to understand concept organization in VI learners, these responses were categorized into taxonomic or thematic relations following Wu and Barsalou (2009).

Learners produced 235 responses which were classified as 'unknown' on the basis of their response in the response sheet. Of the 'Other responses' category, the largest number of errors belonged to that of 'wrong' response (190 responses), e.g., graded response to the stimulus snarl. Table 4 and Fig. 3 present this information.

Table 2

Performance on concrete and abstract concepts

	No of	% of	No of	Other responses

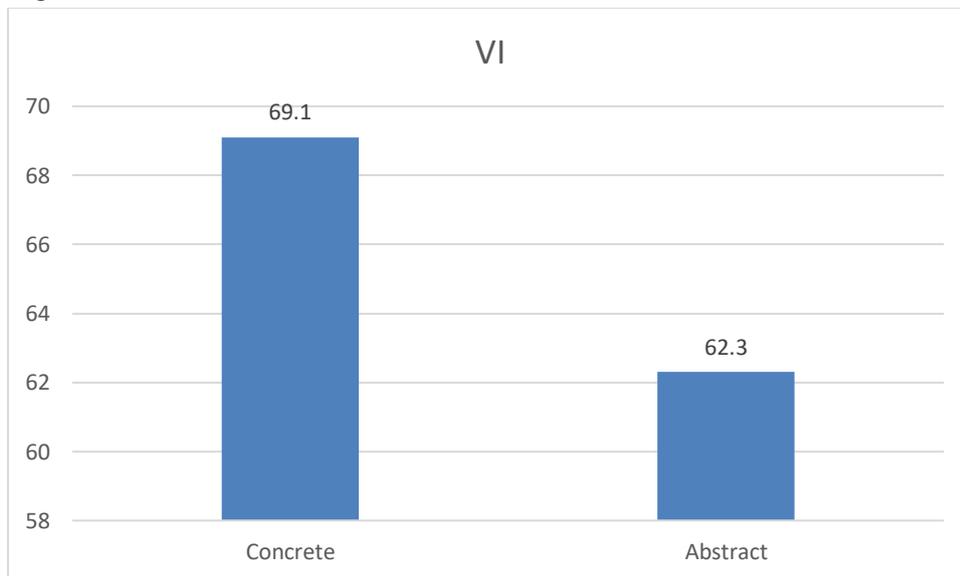|	responses coded as correct	responses coded as correct	unknown responses	Wrong Resp	No Resp	Miscresp
Concrete (23)	395	69.1	82	83	1	11
Abstract (31)	462	62.3	153	107	2	18
TOTAL	856	-	235	190	3	29

Figure 2

Figure 2

It is evident from the table and graph that the overall performance of the VI group on concrete concepts is not very different from that on abstract concepts. A two-tailed t-test returned a p-value = 0.2655, which is not considered to be statistically significant. This

Oray's Publications

Impact Factor: 4.845(SJIF) **Research Journal Of English (RJOE)** Vol-3, Issue-3, 2018

www.rjoe.org.in   An International Peer-Reviewed English Journal   ISSN: 2456-2696

Indexed in: International Citation Indexing (ICI), International Scientific Indexing (ISI), Directory of Research Journal Indexing (DRJI) Google Scholar & Cosmos.
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provides evidence contrary to our major hypothesis that VI learners have difficulties understanding abstract concepts. It also shows that there is no deviance or delay in their understanding of concepts. These findings provide counter-evidence for the idea in the literature that blind children's language is empty or meaningless as visual stimuli that are crucial to concept understanding is unavailable to them.

Support for this finding comes from the situated simulation view of grounded cognition that holds that conceptual representation is multi-modal and is distributed in modality-specific areas in the brain and this information is integrated into simulated recall (Barsalou, 1999). Abstract concepts are mediated or understood through the linguistic information that they convey and the contexts of their use. The linguistic contexts in which they appear convey information of different kinds such temporal, spatial, causal information (Wiemer-Hastings &Graesser, 2000). The common perception that abstract concepts would be much harder to understand for VI learners and would, therefore, elicit a significantly lower number of responses does not receive support. Having established that VI learners understand both concrete and abstract concepts, we examine, in the following section, how this knowledge is organized, i.e., as taxonomic or thematic categories.

Taxonomic vs. Thematic.Table (3) and Fig. below present the details of the performance of the VI group on concrete and abstract concepts respectively. In these tables, the responses have been coded into two major categories - Taxonomic and Thematic - which have been further sub-divided following Wu and Barsalou (2009).

Table 3

Category-wise distribution of responses

	No of responses coded as correct	% of responses coded as correct	Response types (in%)	
			Taxonomic	Thematic
Concrete (23)	395	69.1	69.4	30.6
Abstract (31)	462	62.3	59.7	40.3

Figure: 3

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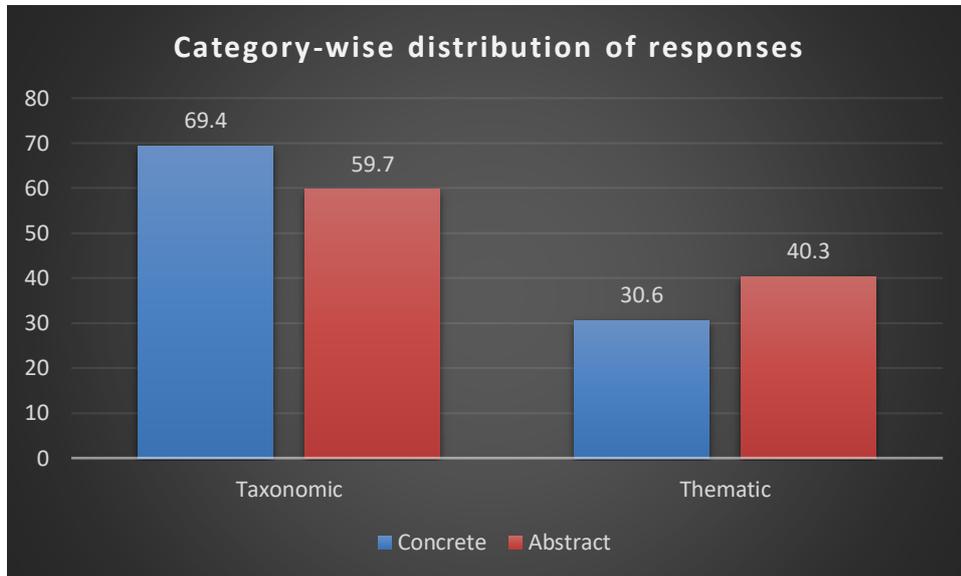
It is evident from the table and the graph, that concrete, and abstract concepts elicit both taxonomic and thematic relations. This supports our hypothesis and findings in the literature that both taxonomic and thematic relations exist side by side. Of the 69.1% of coded responses for concrete concepts, taxonomic relations account for 69.4% while thematic relations account for 30.6%. A t-test to determine whether the difference between taxonomic and thematic relations for concrete concepts returned p-value <0.0001 (t = 4.7409, df = 32) which means that the difference is extremely statistically significant. Of the 62.3% of coded responses for abstract concepts, taxonomic relations account for 59.7%. A t-test showed this difference to be statistically significant (p = 0.0041, t = 3.0892, df = 32). Anticipating a little, this appears to be in contrast to the pattern observed for our SL group who produced a higher percentage of thematic relations (64.1%) than taxonomic relations (35.9%) for the concrete concepts presented to them (see sec. 4.3.1.1).

The preponderance of taxonomic relations over thematic relations suggests that the VI group tends to organize their knowledge in hierarchical terms. Thematic links require a larger network of associations between different domains of knowledge, i.e., the events and situations in which these concepts can occur and how they link up. Though the VI group is able to integrate information from various sources, the network of associations is perhaps not rich and varied enough to afford a wide variety 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' as we shall see below in the sub-categorization shown below in Table 4.

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 the situation and convey information on the contexts and events in which they occur rather than the taxonomic category they belong to. As we shall see later in Sec. 4.2.2.1, the abstract verbs presented in this study elicited a high percentage of responses and this is perhaps due to the fact that linguistic context provides information for abstract concept understanding.

Table 4

Categories	Sub-categories	Concrete	Abstract
Taxonomic	*Synonym*	117	89
	Superordinate	23	11
	Coordinate	62	94
	Individual	71	82
	Antonym	1	0
Thematic	*Larger whole*	5	0
A. Entity properties	*External surface property*	15	2
	Systemic property	23	1
	Location	7	1
	Action	0	19
	Associated entity	3	2
B. Situation Properties	*Function*	4	9
	Manner	0	12
	Event	8	3
	State of the world	39	79
	Affect/ Emotion	8	41
	Evaluation	2	4
	Representative state	2	2
C. *Introspective* *properties*	*Cognitive operation*	0	2
	Contingency	5	7
	Negation	0	2
TOTAL		395	462

As we can see, within the taxonomic category, synonyms account for 42.7% and 32.2% of the responses across concrete and abstract concepts respectively. Coordinates account for 22.6% and 34% and Individual accounts for 25.9% and 29.7% across concrete and abstract concepts respectively. This shows that the VI group possesses category knowledge and tends to organize information hierarchically.

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 contexts, such as animate beings, physical and social status, 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 bilinguals have 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 the categorization abilities of bilinguals vary because of the influence of cultural and linguistic factors.
Sheng & Lam, (2015) also showed that parental input, especially maternal input, has a role to play in the development of taxonomic relations. This finds echoes in our context, where the Principal of the Devnar, who was also the language teacher, went to great lengths to explain the meanings of unfamiliar words, using different methods such as demonstrating the meaning, providing synonyms etc. it is possible that her input in the classroom has a vital role to play in contributing to their categorization ability. As we weren't allowed to interview the subjects, we could not explore further as to why they gave us particular responses.

Nouns vs. verbs

Recall that a total of 36 nouns and 18 verb concepts were presented and that learners were allowed to produce up to three responses for these. Table 5 and Fig. 5 provide the details of the VI group's performance across the categories of nouns and verbs.

Table 5

Performance on nouns and verbs

	No of responses coded as correct	% of responses coded as correct	Unknown	Other Responses		
				Wrong	No Resp	Misc
Nouns (36)	579	64.0	181	125	1	18
Verbs (18)	410	67.8	54	65	2	11

Figure: 4
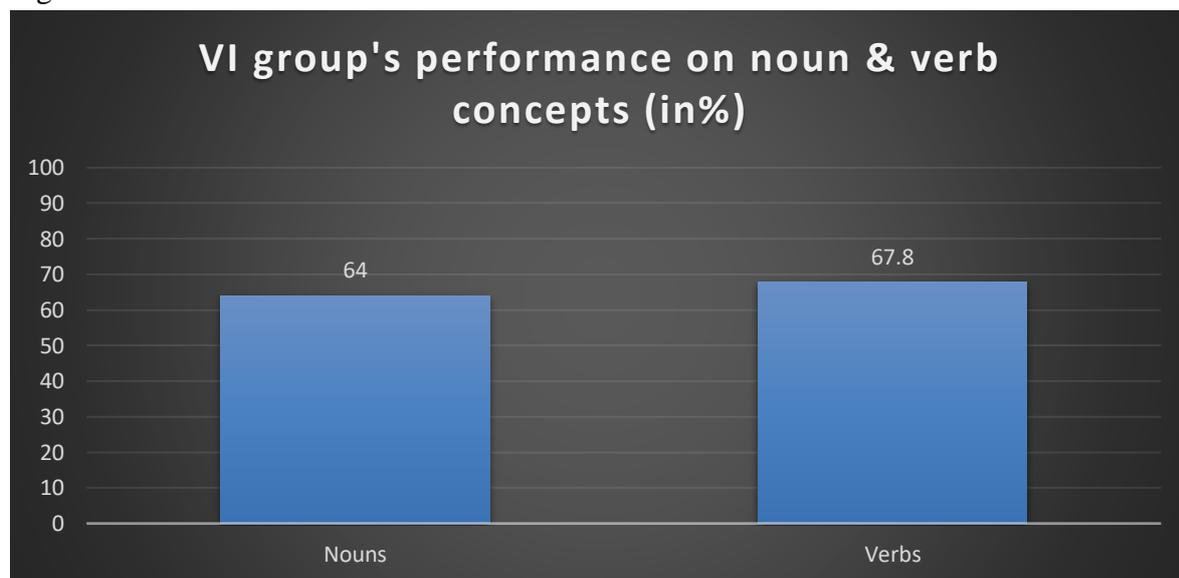
Nouns (concrete and abstract) elicit 64% responses in comparison to verbs (both concrete and abstract) which elicit 67.8% responses. Contrary to our hypothesis that the performance of nouns will be better, we find that the performance on verbs is better though this difference is not significant. A t-test to determine the difference in performance on nouns and verbs returned a p-value < 0.0001(t = 4.9664, df = 32) which is considered extremely statistically significant. Anticipating a little, we find that this pattern emerges in our SL group as well.

One reason for this could be that a number of concepts presented here are unfamiliar to our subjects as they do not come across many of these in daily use. Moreover, they have not been taught these before. Concrete nouns such as hose, snarl and stride, which were rated very low on the familiarity scale (5.5%) and abstract nouns such as scorn, cosmic, passivity, activism, ambiguity, antithetical and turmoil have been identified by all our VI learners as either unfamiliar or least familiar on the familiarity scale (the familiarity evaluation for these words ranged from 0% to 16.6%). These words also accounted for a large percentage of unknown or no response. In an ESL context, words such as those are more popularly referred to as pipe or tube. Similarly, words such as stride and snarl which express fine distinctions are used less frequently and it is more common for learners to use terms like walk and bark respectively. The latter two words snarl and stride have been used in the textbook (and 71therefore in this study) in their noun forms. When presented in isolation, as in the word association task, these words could also be interpreted as verbs.

In the case of abstract nouns, for instance, antithetical has been associated with analyzing things and cosmic with make- up. Similarly, activism has been associated with the programmer. This lends credence to the idea in the literature that abstract concepts are linked to subjective experiences which are available only through introspection (Wiemer-Hastings &Xu, 2005). As Wiemer-Hastings &Xu (2005, p733) state, "mental experience is a key element to only abstract concepts, whereas intrinsic item features are unique to concrete concepts. These are words that they encounter often in the language of textbooks, news and in their surroundings. The familiarity ratings for these words ranged from 66.6% to 777.77%.

Taxonomic vs. Thematic.Table 8 and Fig.6 below present the details of the performance of the VI group on the noun and verb concepts respectively. Here, as previously, the responses have been coded into the two major categories of Taxonomic and Thematic.

Table 6

	No of responses coded as correct	% of responses coded as correct	Response types (in %)	
			Taxonomic	Thematic
Nouns (36)	579	64.0	55.7	44.3
Verbs (18)	278	67.8	82.0	18.0

Figure 5
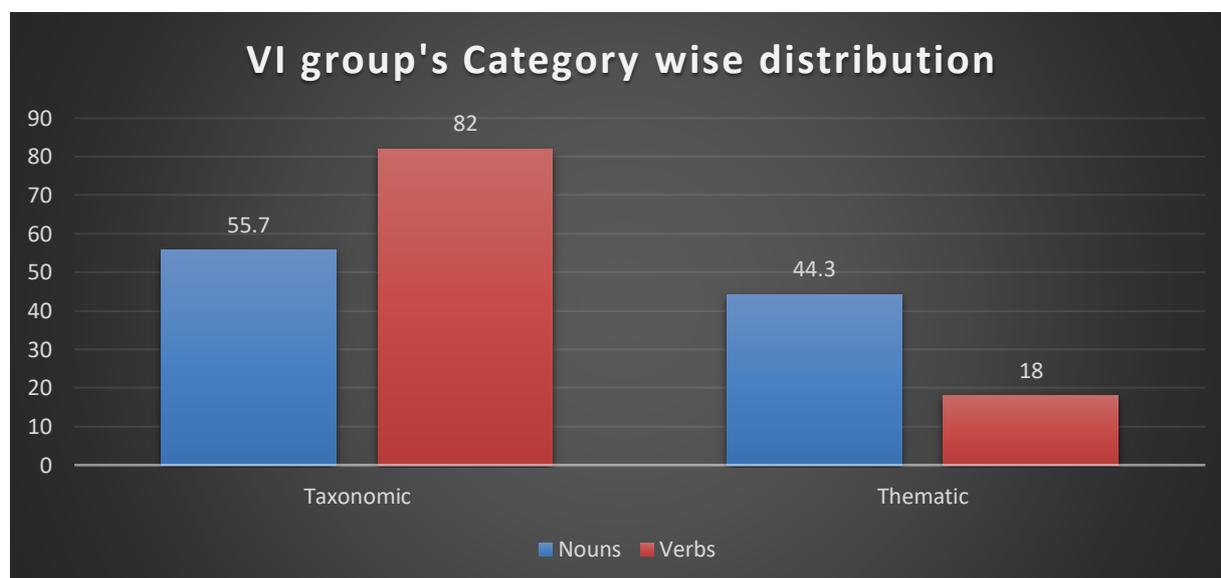
As is evident from Table 8 and Fig. 6, both noun and verb concepts elicit taxonomic and thematic relations supporting our hypothesis. Mirroring the pattern observed for concrete and abstract concepts, here too there is a larger percentage of taxonomic relations than thematic relations for nouns and verbs.

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 imageability 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 imageability 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 kinesthetic, tactile and linguistic even though the modality of vision is absent. Table 9 presents the sub-categorization of nouns and verbs.

Table 7
Sub-categorization of nouns and verbs

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Categories	Sub-categories	Nouns	Verbs
Taxonomic	*Synonym*	106	100
	Superordinate	29	5
	Coordinate	93	63
	Individual	94	59
	Antonym	0	1
Thematic D. Entity Property	*Larger whole*	5	0
	External surface property	3	14
	Systemic property	24	0
E. Situation Property	*Location*	8	0
	Action	19	0
	Associated entity	5	0
	Function	11	2
	Manner	12	0
	Event	2	9
	State of the world	94	24
F. Introspective Properties	*Affect/emotion*	49	0
	Evaluation	5	1
	Representational State	4	0
	Cognitive Operation	2	0
	Contingency	12	0
	Negation	2	0
Total		579	278

Once again, we find that synonymous relations account for 32.9% and 43.4% of responses within the taxonomic category for nouns and verbs respectively. This suggests that perhaps our subjects, who are bilingual, tend to organize information in terms of categories (Peña, et. al., 2002, Nanjappa et. al., 2016). For instance, words like equality, revenge, segregation, civil rights, violence documented the highest number of taxonomic relations a spread across the sub-categories of synonyms and co-ordinates. Situation properties account for 58.7% of the responses in the thematic category. The abstract nouns presented in this study included words like recognition, aggression, civilization, dedication, revenge, elicited responses to the highest number of situation properties.

We also find that the verbs elicit few entity, situation or introspective properties. As we have already explained earlier, the verbs that were presented here were ones that have a high percentage of use in daily life and are also imageable.

Summary of findings with VI group

With regard to the VI group's performance on concrete and abstract concepts and nouns and verbs the findings are as follows:

Overall, there is no significant difference in the performance of concrete vs. abstract concepts. When we look at concrete concepts, we find that taxonomic relations are significantly higher than thematic relations. Similarly, for abstract concepts, to we find that taxonomic relations are significantly more for thematic relations.

With regard to nouns vs. verbs, we find that contrary to expectation, the performance on nouns is not significantly different from that on verbs.

For nouns, taxonomic relations are higher than thematic relations through this difference does not approach significance. For verbs, however, taxonomic relations are significantly more than thematic relations.

SL Group

Recall that the group was included in this study for two reasons: we do not have much data regarding the understanding of concepts by sighted learners in an ESL context. The comparison between the two groups will help us understand whether VI learners and SLs differ from in concrete and abstract understanding and the way in which this information is organized or represented in the two groups.
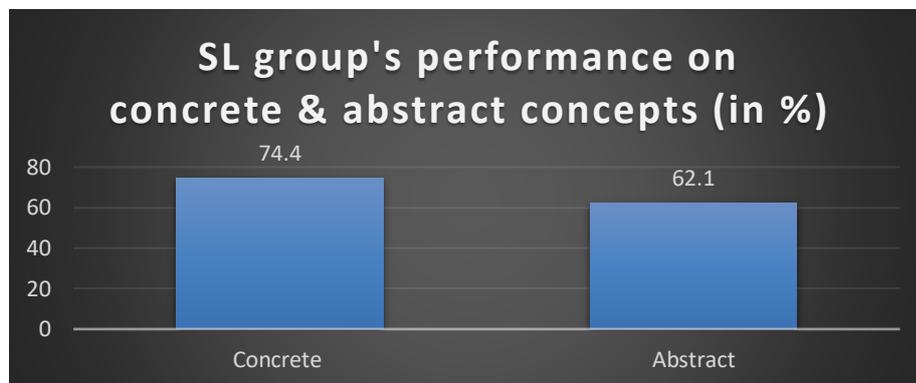
Concrete vs. Abstract

23 Concrete concepts (13 nouns and 10 verbs) and 31 Abstract concepts (23 nouns and 8 verbs) were presented to 19 SL learners in the word association task. The group produced a total of 1788 responses for concrete and abstract concepts presented to them. A total of 1218 responses were coded as correct. Of this, 582 tokens were for concrete concepts and 636 tokens for abstract concepts.

Table 8

Performance on concrete and abstract concepts

	No of responses coded as correct	% of responses coded as correct	Unknown	Other Responses		
				Wrong	No Resp	Misc
Concrete (23)	582	74.4	83	62	51	4
Abstract (31)	636	62.1	104	179	84	2
Total	1218		187	241	135	6

Figure 6

It is evident from the table and graph that the overall performance of the SL group on concrete concepts is slightly better than that on abstract concepts but this difference is not considered to be statistically significant (p-value = 0.5928, t = 0.5396, df = 36).

Our major hypothesis that concrete concepts are easier to understand than abstract concepts does not receive support from this group either. As stated earlier, abstract concepts are mediated or understood through the linguistic information that they convey and the contexts of their use. The linguistic contexts in which they appear convey information of different kinds such temporal, spatial, causal information (Wiemer-Hastings &Graesser, 2000). Our data appear to support the situated simulation view of grounded cognition that holds that conceptual representation is multi-modal and is distributed in modality-specific areas in the brain and this information is integrated into simulated recall (Barsalou, 1999). In the following section, with a view to determining whether SL and VI groups organize this knowledge differently, we examine the performance on taxonomic and thematic categories.
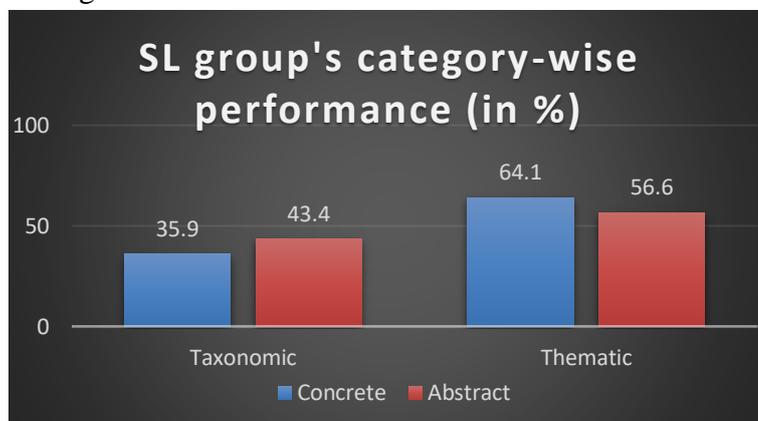
Taxonomic vs. Thematic
Table 11 and Fig. 8 below present the details of the performance of the SL group on concrete and abstract concepts respectively. As with the VI group, the responses have been coded into the two major categories of taxonomic and thematic relations following Wu and Barsalou (2009).
Table 9

Category-wise distribution of responses

	No of responses coded as correct	% of responses coded as correct	Response types (in %)	
			Taxonomic	Thematic
Concrete (23)	582	74.4	35.9	64.1
Abstract (31)	636	62.1	43.4	56.6

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Figure 7

As we can see from the table and the graph, concrete, and abstract concepts elicit both taxonomic and thematic relations. This supports our hypothesis and findings in the literature that both taxonomic and thematic relations co-exist. However, it is interesting to note that there is a reversal of trends with the SL group. While the VI group had a larger percentage of taxonomic responses, the SL group has a smaller percentage of these responses. Of the 74.4% of coded responses for concrete concepts, taxonomic relations account for just 35.9% while thematic relations account for 64.1%. A t-test to determine whether the difference between taxonomic and thematic relations for concrete concepts returned P-value = 0.0022, t = 3.3038, df = 36) which is considered to be very statistically significant. Of the 62.1% of coded responses for abstract concepts, taxonomic relations account for 43.4% while thematic relations accounted for 56.6%. A t-test showed that this difference was not of statistical significance (p = 0.1429, t = 1.4978, df = 36).

The reversed (with respect to the VI group) trend of a larger percentage of thematic relations for concrete and abstract concepts in this group is in keeping with the literature which holds that thematic relations outnumber taxonomic relations in older learners and adults. Recent studies have shown that both concrete and abstract concepts elicit situation properties (Wiemer-Hastings, Krug &Xu, 2001; Barsalou&Wiemer-Hastings, 2005; Wiemer-Hastings &Graesser, 2000). This is borne out by our data in which situation properties account for the largest % of thematic relations as we shall see in the following section. Caramelli, Setti, Muarizzi, (2004) also document a larger number of thematic relations for concrete and abstract concepts. Thus, abstract concepts appear to be characterized by the situations and contexts in which they are used. Table 12 presents the sub-categorization of responses.

Table 10

Sub-categorization of taxonomic and thematic responses

Categories	Sub-categories	Concrete	Abstract
	Synonym	84	68

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Taxonomic	Superordinate	10	5
	Coordinate	45	103
	Subordinate	9	32
	Individual	58	66
	Antonym	3	2
Thematic D. Entity Property	Larger whole	3	27
	External surface property	6	2
	External Component	3	0
	Systemic property	16	47
	Entity behavior	1	4
	Associated abstract entity	25	17
E. Situation Property	Participant	27	23
	Location	30	8
	Spatial	3	1
	Time	1	3
	Action	42	23
	Associated entity	114	114
	Function	14	4
	Manner	1	8
	Event	22	8
	State of the world	15	23
	Origin	8	3
F. Introspective Properties	Affect/emotion	25	13
	Evaluation	19	10
	Representational State	1	9
	Cognitive Operation		13
Total		582	636

As we can see, within the taxonomic category, 'synonyms' account for 40.2% and 24.6% of the responses across concrete and abstract concepts respectively. 'Coordinates' account for 21.5% and 37.3% and 'Individual' accounts for 27.8% and 23.9% across concrete and abstract concepts respectively. This shows that the SL group possesses category knowledge and does categorize information hierarchically. In this, they are similar to the VI group. We find that within thematic relations the percentage of entity properties for concrete concepts is 14.4% while on abstract concepts it is 26.9%. We would like to point out that the percentage of entity properties for SL group on concretes is higher than that for the VI group (1.4%). This could be due to the fact that entity properties encode perceivable and non-perceivable properties of objects which. As we have said earlier, our VI group may not have had

Oray's Publications

Impact Factor: 4.845(SJIF) **Research Journal Of English (RJOE)** Vol-3, Issue-3, 2018

www.rjoe.org.in   An International Peer-Reviewed English Journal   ISSN: 2456-2696

Indexed in: International Citation Indexing (ICI), International Scientific Indexing (ISI), Directory of Research Journal Indexing (DRJI) Google Scholar & Cosmos.
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sufficient experiences with such concepts to build effective networks of associations. Situationproperties were also elicited for both concrete and abstract concepts. As with the VI group (concrete - 50.4% and abstract - 67.2%), situation properties accounted for the highest percentage of thematic relations produced by the SL group, 73.5% and 60.6% for concrete and abstract concepts respectively. Within the sub-category of situation properties, 'associated entity' makes up for the largest number of responses in contrast to the VI group where the largest number of responses was recorded for 'state of the world'. This supports the finding in the literature that situation properties are relational properties and that they describe the relation of an item to other entities in context, such as animate beings, physical and social status, functions, and locations.

We have seen that while the SL group like the VI group shows no significant difference in the performance on concrete and abstract concepts, they tend to organize this information differently, i.e., while the VI group organizes information taxonomically, the SL group organizes this more thematically. We now proceed to look at how the SL group performs on nouns and verbs.
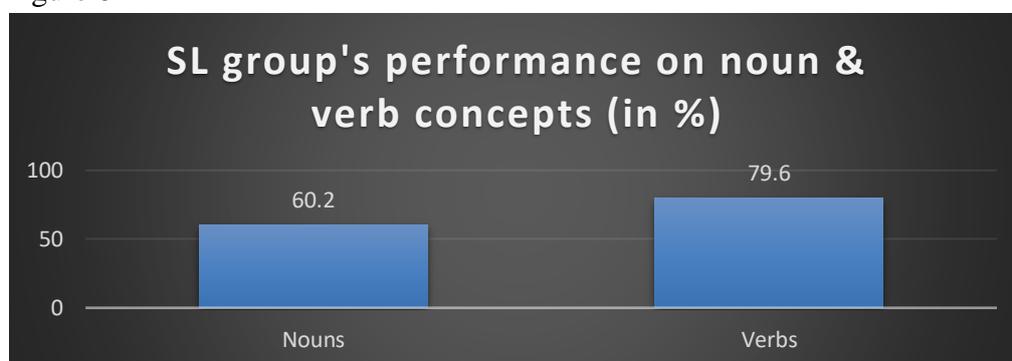
Table 11

Nouns Vs. Verbs

Performance on nouns and verbs

	No of responses coded as correct	% of responses coded as correct	Unknown	Other Responses		
				Wrong	No Resp	Misc
Nouns (36)	681	60.2	160	171	104	6
Verbs (18)	537	79.6	28	70	31	0

Figure 8

As we can see from Table 13 and Fig. 9, nouns (concrete and abstract) elicit 60.2% responses in comparison to verbs (both concrete and abstract) which elicit 79.6% responses. Contrary to our hypothesis that the performance of nouns will be better, we find that the performance on

verbs is better. In the SL group, this difference does not approach significance (p = 0.1343, t = 1.5318, df = 36), whereas it does so in the VI group. As we have already seen with the VI group, the nouns presented contained some items that were unfamiliar to our students, e.g., hose, snarl, stride etc. (see sec. ...). However, unlike the VI group, this group has access to information through perceptual and other modalities and are therefore able to form modality-specific representations for concepts presented to them. In addition, the linguistic information and contexts of use are perhaps more easily accessible to them than the VI group. This is reflected in a large number of situation properties generated by this group in comparison to fewer instantiations of situation properties by the VI group. This is, however, a tentative proposal that needs to be explored further. Interviews with the learners (which we were unable to conduct due to institutional constraints) may help us better understand this difference. Table 14 below presents the categorization of responses on nouns and verbs into taxonomic and thematic.
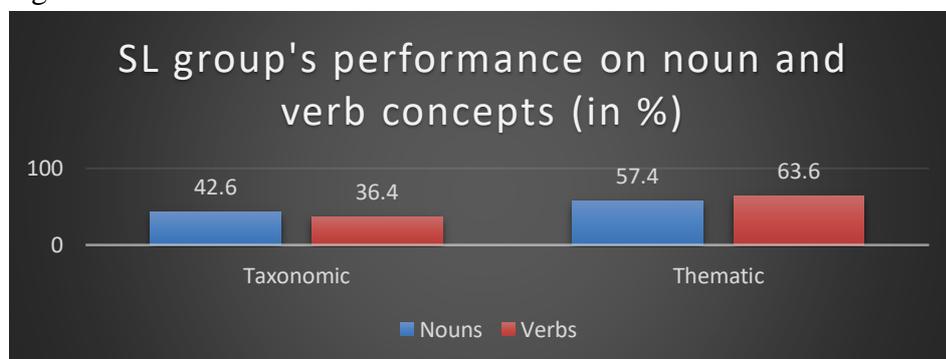
Table 12

Taxonomic vs. Thematic

Table 14 and Fig. 10 below present the details of the performance of the SL group on the noun and verb concepts respectively.

Table 14

Category-wise distribution of responses

	No of responses coded as correct	% of responses coded as correct	Response types (in %)	
			Taxonomic	Thematic
Nouns (36)	681	60.2	42.6	57.4
Verbs (18)	537	79.6	36.4	63.6

Figure 9

As is evident, 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

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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 imageability. The verbs presented such as grinding, crying, opened, orbit are those that have greater imageability and are used regularly in daily conversation. Besides, these verbs also involve actions and are perceptual as well as 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. Table 7 presents the sub-categorization of nouns and verbs, drawing our attention to the larger number of situation properties here than for the VI group.
Table 13
Sub-categorization of taxonomic and thematic responses

Categories	Sub-categories	Concrete	Abstract
Taxonomic	*Synonym*	95	57
	Superordinate	6	9
	Coordinate	70	78
	Subordinate	41	0
	Individual	76	48
	Antonym	2	3
Thematic D. Entity Property	*Larger whole*	28	2
	External surface property	3	5
	External Component	2	1
	Systemic property	36	27
	Entity behavior	5	0
	Associated abstract entity	9	33
E. Situation Property	*Participant*	28	22
	Location	30	8
	Spatial	3	1
	Time	4	0
	Action	25	40

	Associated entity	102	130
	Function	7	11
	Manner	8	1
	Event	7	23
	State of the world	31	7
	Origin	4	0
F. Introspective Properties	*Affect/emotion*	33	5
	Evaluation	8	21
	Representational State	8	2
	Cognitive Operation	10	3
Total		681	537

As we see in the table above, synonymous relations account for 32.8% of responses within the taxonomic category for nouns. Coordinates account for 24% of taxonomic responses on nouns and 40% on verbs respectively. In the thematic category, situation properties accounted for 63.7% of the responses on nouns and 71% on verbs respectively. This lends support to the findings in the literature that abstract and perhaps even concrete items express relational properties. Abstract concepts elicit properties related to "... a social situation involving an agent, and...commonly involve behaviors, agent characteristics (such as goals), and other aspects of a situation"

(Wiemer-Hastings&Xu, 2005). Words like equality, revenge, segregation, civil rights, violence recognition, aggression, civilization, dedication, and revenge were rated high on the familiarity scale and this suggests that the SL group has encountered these words In contexts that convey information about the contexts in which they occur.

Summary of findings with SL group

With regard to the SL group's performance on concrete and abstract concepts and nouns and verbs the findings are as follows:

1. As with the VI group, overall, there is no significant difference in the performance of concrete vs. abstract concepts.

2. When we examine the performance of concrete concepts, we find that thematic relations are significantly higher than taxonomic relations. Similarly, for abstract concepts, to we find that thematic relations are more than taxonomic relations but this is not significant.

3. With regard to nouns vs. verbs, we find that contrary to expectation, the performance on verbs is better than that on nouns but this is not significant.

4. For nouns, thematic relations are higher than taxonomic relations through this difference does not approach significance. For verbs, however, thematic relations are significantly more than taxonomic relations.

Table 14

Fisher exact values comparing VI and SL on concrete and abstract

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Results			
	Concrete	Abstract	*Marginal Row Totals*
VI	395	462	857
SI	582	636	1218
Marginal Column Totals	977	1098	2075 (Grand Total)

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.

Table 15

Fisher exact values comparing VI and SL on taxonomic and thematic (concrete)

Results			
	TAX Con	THEM Con	*Marginal Row Totals*
VI	274	121	395
SI	209	373	582
Marginal Column Totals	483	494	977 (Grand Total)

When we examined the Taxonomic-thematic distinction on concrete concepts, the difference between the two groups on the Fisher exact test statistic value was 0 and the result was significant at $p < 0.05$.

Table 16

Fisher exact values comparing VI and SL on taxonomic and thematic (abstract)

Results			
	TAX Abs	THEM Abs	*Marginal Row Totals*
VI	276	186	462
SI	276	360	636
Marginal Column Totals	552	546	1098 (Grand Total)

Similarly, when we examined the Taxonomic-thematic distinction on abstract concepts, the difference between the two groups on the Fisher exact test statistic value was 0 and the result was significant at $p < 0.05$.

To our understanding, while the VI group does not have difficulty integrates information from various modalities to represent knowledge thematically, the number of affordances of

situations, events entities, and introspective experiences are fewer leading to more taxonomic relations. Moreover, input in an ESL context appears to play a role here.

With respect to the overall performance of the noun and verb concepts, we find that the difference between the two groups is significant with the Fisher exact test statistic value at 0. The result was significant at $p < 0.05$. We find that both groups perform better on verbs than on nouns.

Table 17

Fisher exact values comparing VI and SL on nouns and verbs

Results			
	Nouns	Verbs	*Marginal Row Totals*
VI	579	278	857
SI	681	537	1218
Marginal Column Totals	1260	815	2075 (Grand Total)

The difference between the two groups on taxonomic vs. thematic relations for both nouns (the Fisher exact statistic value is 5E-06 and the result is significant at $p<0.05$) and verbs (the Fisher exact test statistic value at 0. The result was significant at $p < 0.05$) is also extremely significant (see Tables 20 and 21 below). We believe that this difference is in part due to the nature of abstract concepts and abstract verbs in particular which rest on information conveyed by the syntactic and semantic contexts of use and the imageability of these concepts.

Table 18

Fisher exact values comparing VI and SL on taxonomic and thematic (nouns)

Results			
	TAX	THEM	*Marginal Row Totals*
VI	322	257	579
S	290	391	681
Marginal Column Totals	612	648	1260 (Grand Total)

Table 19

Fisher exact values comparing VI and SL on taxonomic and thematic (verbs)

Results			
	TAX Verbs	THEM Verbs	*Marginal Row Totals*
VI	228	50	278
SI	195	342	537

Marginal Column Totals	423	392	815 (Grand Total)

These findings have to be explored with a larger sample in order to be validated. We would also require think-aloud protocols from participants to probe deeper into their understanding of the concepts and to examine what qualitative differences might exist between the two groups in terms of conceptual knowledge representation.

Summary of results

We investigated the understanding and representation of concrete and abstract concepts in two groups –visually impaired and sighted learners in class 9 in Devnar, School for the Blind, Hyderabad and St. Ann's School, Secunderabad, respectively – within the framework of the grounded cognition account of conceptual representation.

Concrete concepts are perceivable and refer to specific objects or entities. They occur in specific spatial contexts and possess attributes such as shape, size, texture, and color. Abstract concepts, on the other hand, can neither be perceived nor are they entirely constrained by context. They refer to processes, events, mental experiences, stories and relations which are a major part of our daily experiences and actions. In addition, they lack physical qualities. While the presence or absence of 'physical' attributes has often been used as a guide to distinguish between concrete and abstract concepts, Wiemer-Hastings &Xu (2005), have shown that concreteness effects exist for concrete and abstract concepts which determine how they are processed and represented. This grading is assumed to rest on context availability, concreteness, and imageability.

A number of theories have been advanced to explain why abstracts are harder to understand than concrete concepts. Most influential among these is Paivio's Dual-code theory which holds that concrete has a perceptual and linguistic code available for their representation while abstract concepts fall back on a linguistic code alone which makes their processing more difficult. The context availability and contextual constraints theories emphasize the role of context in concept understanding. On these theories, context provides support for the processing of concepts (Schwanenflugel&Shoben, 1983). According to the former, an individual must be able to relate the present stimulus to the prior context for effective comprehension to occur. In the absence of prior context, comprehension is affected. The contextual constraints theory holds that abstract concepts depend on the situations or contexts within which they appear and if the constraints on the situations of their use are abstract then, the concept is harder to process.

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

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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 in 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 the 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 the 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 reached significance for the VI group. This we feel is due to an artifact 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 is 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 nuns 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.

Thus our 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 findings from this study need to be validated with a larger sample. The qualitative differences between the two groups would be worth researching in the future.

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