VISUAL PERCEPTION-BASED CATEGORIZATION IN ELEMENTARY AND SECONDARY SCHOOLERS[1]

İLKOKUL VE ORTAOKUL ÖĞRENCİLERİNDE GÖRSEL ALGI TEMELLİ ULAMLAŞTIRMA

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Abstract
In this experimental study, cognitive and linguistic aspects of Turkish elementary and secondary schoolers' categorical level preferences were observed to find out which categorical levels they exploited more to name the category pictures. Two sets of pictures composed of NATURAL KINDS, ARTIFACTS and EVENT/ACTION categorical groups were used. Two different tests (R1 and R2) were applied. R1 pictures belonged to the categories the participants were familiar with and could name easily. R2 pictures, in contrast, were difficult to identify and name specifically. In the results, participants tended to name R1 categories in BASIC level (e.g. shirt), which proved the privileged cognitive status of BASIC level. On the other hand, R2 categories were mostly named in SUPERORDINATE level (e.g. insect), which showed that children knew how and when to use SUPERORDINATE naming. As for the naming in SUBORDINATE level, the participants were observed to behave tentatively. Among the categorical groups, they made more specific namings for ARTIFACTS than the others.

Öz
Bu deneysel çalışmada, ilkokul ve ortaokul öğrencilerinin ulam resimlerini adlandırmadaki ulamsal düzey tercihleri, hangi ulamsal düzeyden daha fazla yararlandıklarını bulmak amacıyla bilişsel ve dilsel yönlerden gözlemlenmiştir. Çalışmada; DOĞAL TÜRLER, İNSAN YAPIMI EŞYALAR ve OLAY/EYLEM ulamsal gruplarından oluşan iki resim grubu kullanılmış ve iki farklı test (R1 ve R2) uygulanmıştır. R1 testindeki resimler katılımcıların kolaylıkla tanıdığı ve adlandırabildiği; R2'dekiler ise, ayrıntılı olarak tanımlanması ve adlandırılması zor resimlerden seçilmiştir. Katılımcılar R1 testindeki resimleri ağırlıklı olarak TEMEL düzeyde (örn, gömlek) adlandırmışlardır. Bu sonuç, TEMEL düzeyin ayrıcalıklı niteliğini doğrulamaktadır. R2'deki resimler ise ağırlıklı olarak ÜST düzeyde (örn. böcek) adlandırılmıştır. Bu sonuç ise, çocukların ÜST düzey ulamları nasıl ve ne zaman kullanacaklarını bildiklerini göstermektedir. ALT düzeyde adlandırma söz konusu olduğunda, katılımcıların çekinceli davrandığı gözlemlenmiştir. Ulamsal gruplar arasında İNSAN YAPIMI EŞYALAR için daha ayrıntılı adlandırmalar yapılmıştır.

1.INTRODUCTION

First few years of life are the primary focus of language acquisition studies in linguistics. Children are surrounded by an array of objects: Hundreds of artifacts, dozens of different kinds of animals, plants and other natural phenomena to learn about. They can classify or group them in numerous and also idiosyncratic ways. (Markman,5). According to Clark (476-477), in learning a language, children learn

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particular conventions for the available lexical forms used to convey semantic categories. The conventions of the language are critical for learning the lexicosemantic categories of that language, and for learning how to map these to existing conceptual categories.

Preschool period extends to almost the age of five. However, language acquisition cannot be restricted to only preschool years. Acquisition continues in different environments among which the most important one is the school environment. As children enter formal schooling in which immense academic learning takes place, a new phase in children's life begins. Carroll (284) states that later acquisitions by the child and language development through the life span are important topics of study.

One very important linguistic aspect of formal schooling is the novel categories learned through language instruction in various educational contents such as math, language, science, etc. Organization of the new-learned categories is a challenging task the schoolers face with. Therefore, *categorization* appears to be the basic cognitive tool to cope with this challenge. As Evans and Green (16) define, categorization is our ability to identify entities as members of groups and the words we use to refer to entities rest upon categorization. In other words, categorization is a prerequisite cognitive faculty for linguistic performance, specifically for *naming*.

According to Smith and Kossylyn (148-149) knowledge is information about the world that is stored in memory, ranging from everyday to the formal. Knowledge makes ordinary life possible in a number of ways. It is essential for the competent functioning of most mental processes, not only in memory, language, and thought, but also in perception and attention. Without knowledge, any mental process would stumble into ineffectiveness. Specifically, you would be unable to categorize things. Categorization is the ability to establish that a perceived entity belongs to a particular group of things that share key characteristics.

We can name our surroundings (e.g. objects, actions or events) in different categorical levels maintaining the same meaning frame. For example, a *rocking chair* can be named as *chair* or *furniture* as well. While this can solely be a matter preference in some cases, it can also be motivated by context in others. Or, lack of knowledge or life experience can impose on our categorical level preference.

Naming is an indispensable linguistic facility since it provides labels for objects and actions/events. It is also directly related with the categorical level they belong to. A category name like *rocking chair* gives us more detailed information (than *chair*)

about one distinctive feature of a special chair thanks to the lexeme *rocking*. That means, names also convey information about the entities they label. For children, therefore, one of the challenging aspects of mother tongue acquisition is learning category names which are important parts of language conventions.

1.1 Purpose of the study

In this experimental study, Turkish elementary and secondary schoolers' categorical level preferences were observed to find out which categorical levels they would exploit to name the objects or actions depicted in the pictures. This research will make contributions to cognitive architecture of elementary and secondary schoolers and also offer an insight into their categorization skills. It will also reveal some lexical aspects of the first eight years of formal schooling period in terms of linguistic development.

2. THEORETICAL FRAMEWORK: Words, categories and meaning

Words we do not know do not have any meaning to us because they are only sound patterns (or vocal vibrations) in spoken language or patterns of spellings in written language unless they relate to any sort of knowledge in the mind. In order for the word *dog* to be meaningful, one must have a mental description of *dog* that involves a certain amount of knowledge about the "real life-dog(s)" in one's mind so that he can link the sound form and the mental descriptions of it. The meaning is therefore a mental description. It is also called *concept* or *category* (Löbner 20).

Dirven and Verspoor (25) explain the relation between the world and the linguistic system as the following:

> Language helps us categorize our experiences of the world. Therefore, the answer to the question "What is in a word?" is relatively simple: 'The whole world', or at least all the experiences we have of our world that have somehow been categorized linguistically.

By all means, we need a sum of knowledge that dwells in our mind and that contains what we know about the world objects and events. Therefore, the language and the meaning it conveys are highly dependent on the world knowledge. In the physical world, people are surrounded by objects, actions, events and they all have emotions and judgements about them. Each of these pertains to discrete categories as far as the nature of the thought is concerned. However, when it comes to *label* or *name* them, an additional categorization is inevitable: *linguistic categorization*. This gives rise to creating discrete lexical forms for each category, or what we call *lexical*

categories/concepts. Categorical system in the mind is well organized in various ways and so the lexical categories are. Taxonomic relations among the categories are one of them. The hierarchical relations between mental entities are stored in terms of mental taxonomies in the mind.

According to Rosch (191), *"A taxonomy is a system by which categories are related to one another by means of class inclusion. Categories are generally designated by names. The greater the inclusiveness of a category within a taxonomy, the higher the level of abstraction."*

The following is a simple taxonomic schema composed of three different levels of inclusiveness.

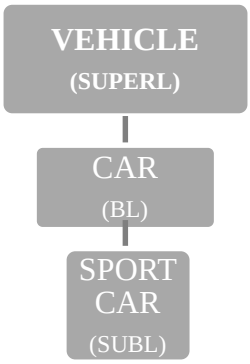


Figure 1- A simple taxonomy

There are three hierarchical levels in a typical taxonomy: SUPERORDINATE, BASIC and SUBORDINATE levels (hereafter SUPERL, BL, SUBL respectively). It was Brown who mentioned first about the hierarchical levels and drew attention to the privileged status of BL. He asked a basic question: "What determines the name given to a child for a thing?". He argued that a "thing" may have many equally correct names but parents show a considerable regularity in their preference for one of the many possible names. These names are the shortest and the most common ones (Brown 20). BL categorization must not be thought for only concrete objects. It is the level of distinctive actions (Lakoff 32). *Eat, walk, think* are all BL action categories.

According to Taylor (*Cognitive Grammar* 131), BL is the level at which things are called unless there are good reasons to do otherwise. BL categories (or names) carry neither less nor more information than required (e.g. *dog*, *ice cream, shirt, eat*). Löbner (185) states some important features of BL: It operates faster than higher and lower levels (SUPERL and SUBL) in psychological experiments and response times for BL categories are the shortest. It is the level at which most of our knowledge is organized. BL objects have peculiar overall shapes so it is quite easy to draw a *saxophone* but

not *musical instrument*. Ungerer and Schmid (79) claims that BL words are the first words acquired by the children. In addition to their high frequency of occurrence, BL terms are generally short and structurally simple as *dog, car, shirt* etc. (Taylor, *Linguistic Categorization* 49). Schmid (122) asserts that well-entrenched concepts possess more long-term memory advantage and it is on the BL categorization that the most deeply entrenched categories are found.

SUPERL is occupied by the most inclusive but the least detailed categories (e.g. *dessert, garment, vehicle*). However, unlike BL categories, they do not have mental images in the mind therefore one cannot draw a picture of *garment*. Taylor (*Cognitive Grammar* 132) says that units above BL are generally so schematic that they are applicable to a very wide range of entities. For this reason, to call something by a SUPERL name tells you very little about the entity in question.

SUBL categories like *chocolate ice cream, short-sleeved shirt* carry the most detailed information. According to Ungerer and Schmid (81), the reason why we use SUBL categories is we want to stress or highlight the specific attributes (e.g. *color, shape, material* or *use*) they feature. As far as the order of acquisition of categorical levels in young children (aged between 2-6 years) is concerned, Mervis and Crisafi found that categorization ability is acquired in the following order: BL, SUPERL and finally SUBL.

Dirven and Verspoor (25-26) state that semantics, systematic study of meaning, deals with lexicology, morphology and syntax. Lexicology relates to the meanings of words and has two basic approaches: We can go from the form of a word to the various sense, which is called *semasiology*. Classical dictionaries take the semasiological point of view. Or, we can start from the concept (sense) and see what different words are available as synonyms to refer to the entities in our conceptual world, which is called *onomasiology*. This is what a *thesaurus* does.

Taylor (*Cognitive Grammar* 186) takes the same issue as something between language and the world. According to him, the semasiological perspectives goes from language to the world and investigates what kind of situations can be appropriately designated by the expression. Onomasiological perspectives, on the other hand, go from the world to language and investigate what kind of linguistic expressions can describe this state of affairs.

There are some picture naming or object recognition/identification studies that are worth mentioning here. Some of these were conducted with children as participants. For example, in an experimental research, Cycowicz et al. made a comparison of child and adult categorical level naming and found that that young children are different from adults in both the name most frequently assigned and the number of alternative names provided. The alternative names given by the children are either coordinate names or names of objects that are visually similar to the pictured object. In addition, the failure (to name) rate is higher among young children compared to adults.

Among the studies carried out with adults, Jolicoeur, Gluck and Kosslyn found out that objects are identified first particular level of abstraction which is neither the most general nor the most specific possible. Murphy and Brownell conducted an object-recognition experiment with undergraduate students. They noted that, when people are asked to decide whether an object is in a given category, they generally respond faster when the category is at the basic level than when it is at the superordinate level or the subordinate level. Basic categories have shorter and more frequent names, are learned earlier, and are usually more highly differentiated than other categories. They also found that atypical subordinate categories (e.g., racing car) that were highly differentiated were responded to as fast as basic categories in object recognition. Rosch et al. is also a groundbreaking study in the field of psycholinguistics. This study will be discussed thoroughly in part 3.5.

3.METHOD

3.1 Research design

The current study is an empirical one which employs both qualitive and quantitative methods and it collects primary data from the participants through the purpose-built tests. It also has true experimental design.

3.2 Approach

The method of this study is based on the *onomasiological approach* which has been explained in the Introduction part. The subjects were supposed to name the object and event/action categories depicted in the pictures. That is to say, they elicited linguistic forms (namings) starting from the concepts (category pictures).

3.3 Research group

The participants were gathered from the students getting education at four different grades (2nd, 4th, 6th and 8th) in the state elementary and secondary schools in Mamak which is one of the central towns of Ankara. The schools were selected randomly. The participants were aged between 8 and 14. Totally 240 students (60 participants from each grade) were included. Male and female subjects were included in equal number though sex was not taken as a variable. The participants were chosen by random sampling method. The classes were determined by the approval and guidance of school administration. No criterion other than the convenience of the class schedule was taken into consideration. The students in the classes were included as participants regardless of their academic success levels.

3.4 Data collection tool and analysis

The pictures of the categories to be shown were downloaded from Google search engine and "Research Ethics Committee Approval" was obtained from Ankara University regarding the pictures. The tests were conducted in classroom setting and were completed successively in one session.

Two tests were designed to observe the participants' naming behavior. In the test forms, the participants were asked to answer basic questions such as "*Bu nedir?" (What is this?)* and "*Bu kişi(ler) ne yapıyor?" (What is this person/are these people doing?)* in Turkish while the pictures of categories were being projected on the screen. Two different sets of pictures, each having 12 objects and event/action pictures were used (see the Appendix III). R1 pictures were "easy to name categories". R2 pictures, in contrast, were selected from the pictures difficult to name specifically. In both tests, the categories were composed by *NATURAL KINDS, ARTIFACTS* and *EVENT/ACTION* categories in equal number.

The answers (namings) in the forms were coded in terms of categorical levels (SUPERL, BL, SUBL) by the author of the study. They were transferred to Microsoft Excel and combined in one table as shown in Appendix I. The database was analyzed in terms of the following criteria: (i) Frequencies of the categorical levels corresponding to the namings. (ii) Typical co-occurrences of the categorical levels in the answers (iii) Typicality of namings. (iv) Findings on the categorical groups.

In order to analyze the data obtained from the tests, first, frequency and percentage values regarding R1 and R2 results were calculated and then presented in tables and graphs to provide better interpretation. Kruskall Wallis test was used

to show whether the differences between the R1 and R2 results across the grades were significant or not. Since both the scores of the grade levels are discrete variables and homogeneity of variances are not equal, nonparametric statistical method was used. The interpretation of the results was made according to p=0.05 significance value.

3.5 Peculiarity of the current study

Since the methodology of the current research study has been inspired by the seminal research titled as "Basic Objects in Natural Categories" carried out by Rosch et al., it would be convenient to give some details about its content and methodology. Rosch et al., which was a ground breaking experimental study in the field of psycholinguistics involved twelve experiments. Experiment 1 included a taxonomy consisted of biological and nonbiological objects (9 SUPERL, 27 BL and 54 SUBL categories). The authors used this basic taxonomy (see Table 1) for the other experiments as well.

Table 1- The taxonomies used in Rosch et al. (Original table is reproduced)

Superordinate	Basic	Subordinate	
Nonbiological taxonomies			
Musical instrument	Guitar	Folk guitar	Classical guitar
	Piano	Grand piano	Upright piano
	Drum	Kettle drum	Base drum
Fruit	Apple	Delicious apple	Mackintosh apple
	Peach	Freestone peach	Cling peach
	Grapes	Concord grapes	Green seedless grapes
Tool	Hammer	Ball-peen hammer	Claw hammer
	Saw	Hack hand saw	Cross-cutting hand saw
	Screwdriver	Phillips screwdriver	Regular screwdriver
Clothing	Pants	Levis	Double knit pants
	Socks	Knee socks	Ankle socks
	Shirt	Dress shirt	Knit shirt
Furniture	Table	Kitchen table	Dining room table
	Lamp	Floor lamp	Desk lamp
	Chair	Kitchen chair	Living room chair
Vehicle	Car	Sports car	Four door sedan car
	Bus	City bus	Cross country bus
	Truck	Pick up truck	Tractor-trailer truck
Biological taxonomies			
Tree	Maple	Silver maple	Sugar maple
	Birch	River birch	White birch
	Oak	White oak	Red oak
Fish	Bass	Sea bass	Striped bass
	Trout	Rainbow trout	Steelhead trout
	Salmon	Blueback salmon	Chinook salmon

Bird	Cardinal	Easter cardinal	Grey tailed cardinal
	Eagle	Bald eagle	Golden eagle
	Sparrow	Song sparrow	Field sparrow

Experiment 10, which we focused on, included a category naming task carried out with the university students as informants. It had two parts. In the first part, category pictures were distributed and the informants were supposed to write names for them. The results showed that the pictures were mostly named at BL. For example, the subjects named an "electric guitar" picture as "guitar" although they were likely to be familiar with SUBL category name "electric guitar". Some of the informants named the pictures wrongly though what they wrote corresponded to any categorical level. However, the right or wrong matching between the naming and the category pictures was not taken into consideration in the first part.

Yet, it was not clear whether the subjects' preference on BL naming over SUPERL and SUBL might have been due to ignorance. Therefore, their knowledge on these less preferred levels was tested in the second part. This time, the objects in the pictures were presented with sentences like "This is an electric guitar", "This is furniture". Wrong names were deliberately provided for half of them by the authors and the subjects were supposed to write "true", "wrong" or "I don't know". In the results, the subjects knew SUPERL categories much better than SUBL ones. Nonbiological (artifacts) categories were known much better than biological (e.g. kinds of trees, fish) categories.

The methodology of the current study exhibits some differences from Experiment 10 in some respects. First of all, the second part of Experiment 10 was not applied in our study. Secondly, the current study employed three categorical groups (*NATURAL KINDS, ARTIFACTS* and *EVENT/ACTION*) whereas Rosch et al. included only two (*biological* and *nonbiological*). Thirdly, the category list of the current study was different from that of Rosch et al. Finally, our research group was composed of elementary and secondary schoolers while Rosch et al. employed university students as participants. Though the current study adopted the basic experimental design of Rosch et al., we did not aim to make an extensive comparison between their findings since the latter is an old-dated research on a different language and culture. However, some similarities regarding the findings will be mentioned when necessary.

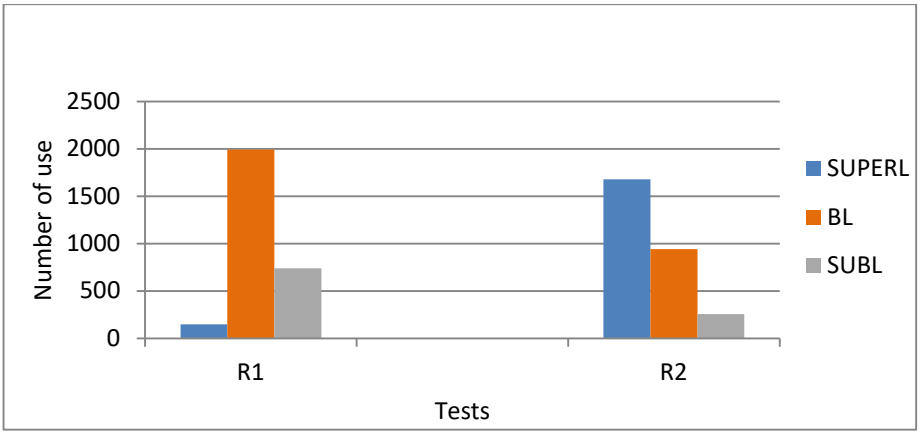
4.RESULTS

4.1 Frequencies of the categorical levels corresponding to the namings

According to the overall results, research group produced much more BL naming in R1 than the other levels. As seen in Table 2 and in Bar graph1 below, approximately one fourth of the overall namings is in SUBL. Barely %5,14 of the namings is in SUPERL. As for R2, SUPERL naming is dominant. While naming in BL appeared as the second, SUBL naming has the lowest frequency.

Table 2- Frequency and percentage values of categorical levels

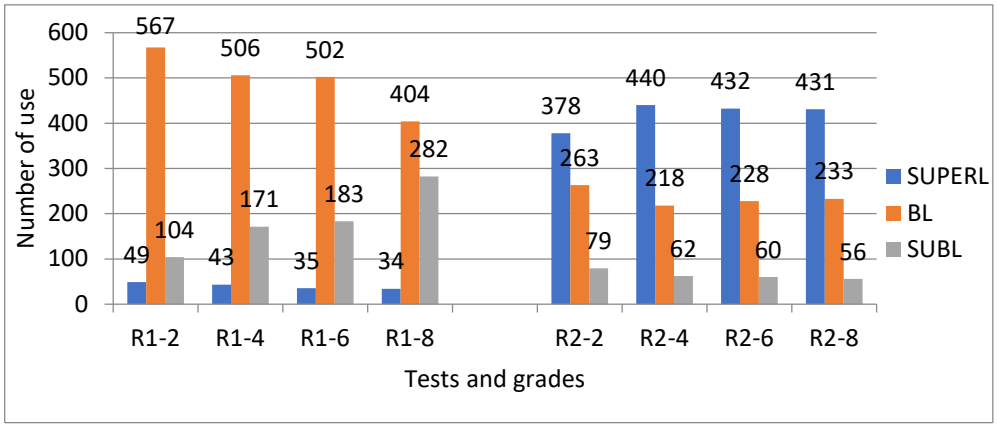
	R1 *f*	R1 (%)	R1 *f*	R2 (%)
SUPERL	148	5,14	1680	58,33
BL	1992	69,16	943	32,74
SUBL	740	25,70	257	8,93



Bar graph 1- Distribution of participants' answers in terms of categorical levels

It is seen that there is a sharp increase in the use of SUPERL naming when we switch from R1 to R2 and SUPERL namings increase by almost eleven times. In the meantime, a decrease to slightly more than half rate in BL occurs. As for the change in SUBL use, like BL, we see a decrease again. It is understood from SUBL results that unlike R1, the subjects avoided detailed naming in R2.

Bar graph 2 gives the overall results in terms of school subgrades.



Bar graph 2- Distribution of the categorical levels across the school grades

As can be observed, BL dominance steadily switches to SUBL as the age increases in R1. SUPERL naming is the least preferred one, and it slightly increases with the age. The 2nd grade students are the subgroup who use the most BL level naming. On the other hand, the 8th grade's high SUBL preference is remarkable.

Kruskal Wallis test has been used if there are statistically significant differences between the subgroups in R1 (also in R2). According to the results;

- In R1, the difference between 2nd grade and the others (2nd-4th; 2nd-6th; 2nd-8th) are significant. ($p<0.05$)
- In R1, the difference between the 4th and 6th grades is not significant. ($p>0.05$)
- In R1, the difference between the 4th and 8th grades is significant. ($p<0.05$)
- In R1, the difference between the 6th and 8th grades is significant. ($p<0.05$)

In R2, between the 2nd and the 4th grades, there are a noticeable increase in SUPERL and decrease in BL naming, however scores change very slightly among the 4th, the 6th and the 8th grades. According to Kruskal Wallis test;

- In R2, the difference between the 2nd and the other grades (2nd-4th; 2nd-6th; 2nd-8th) is significant. ($p< 0.05$)
- In R2, the difference between the 4th, 6th and 8th grade is not significant. ($p>0.05$)

4.2 Co-occurrences of the categorical levels in the answers

The co-occurrences of the categorical levels to which the namings correspond have been analyzed in this part. The last two columns on the right in Appendix I gives us the categorical level patterns by which the subjects do the namings. For example, if a subject named the first pictures in R1 and R2 as BL-SUPERL, this forms a categorical naming pattern. There are nine patterns of this sort as seen in the Table 3 below, which gives us the distribution of these patterns in totally 2880[2] namings the subjects elicited.

Table 3- Co-occurrences of categorical levels

(R1-R2)	*f*	%
BL-SUPERL	1150	39,931
BL-BL	642	22,292
SUBL-SUPERL	473	16,424
SUBL-BL	238	8,264
BL-SUBL	200	6,944
SUPERL-BL	63	2,188
SUPERL-SUPERL	57	1,979
SUBL-SUBL	29	1,007
SUPERL-SUBL	28	0,972

The percentage of the subjects who prefer BL names in R1 and SUPERL names in R2 together amount to almost 40% of the overall co-occurrences. BL-BL co-occurrence ranks the second. The dominance of BL in the answers can be seen from the first two rows. Co-occurrences involving SUBL, however, appear only towards the bottom of the table.

[2] As can be followed from Appendix 1, each participant has 12 categorical naming (i.e. *answer*) patterns. Since research group involves 240 participants, totally 2880 patterns are obtained.

4.3 Typical namings

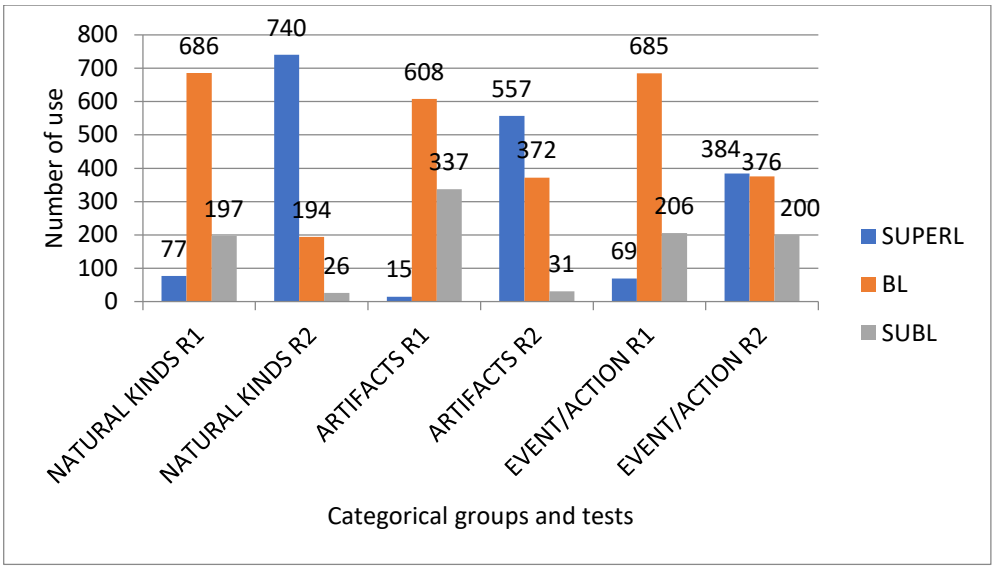
Appendix II reveals the typicality of the namings (the highest three for each picture) and related categorical levels. In other words, the degree of prototypicality of the namings is given.

As will be observed from Appendix II, two namings in R1 (arı-*bee*; sebze alıyor-*buys vegetable*) and five in R2 (ot-*plant*; makine-*machine*; mobilya-*furniture*; bilgisayar kasası-*computer box*; yemek yapıyor-*he cooks*) have low degree of prototypicality (i.e. have rate below 50%). It is not a coincidence that more atypical namings in number exist in R2 in which relatively unfamiliar category pictures were included. In some pictures, the informants took not only the dominant figure but also the background. The first category of R1 is such an example. The prototypicality of *bee* seems low but we might consider it together with the second and the third naming together. This example also proves the importance of *context* in naming.

4.4 Categorical groups

As we stated previously, the pictures in the subtests have been organized as groups of four and there are three categorical groups in each test. These are *NATURAL KINDS, ARTIFACTS* and *EVENT/ACTION*. Each group contains four category pictures to be named. The database has also been analyzed in terms of these categorical groups.

Bar graph 3 shows the distribution of the categorical levels in which the subjects name the category pictures in terms of categorical groups.



Bar graph 3- Distribution of categorical levels across categorical groups

R1 results indicate BL salience for all the categorical levels and SUBL namings always exceed SUPERL naming. This pattern can be constantly observed in all categorical groups. That the number of SUPERL naming in the *NATURAL KINDS* is slightly five times more than that of the *ARTIFACTS* is important. In addition to this, high scores of SUBL level in the *ARTIFACTS* are particularly remarkable.

In R2, the dominant naming level is SUPERL which reaches its maximum rate in the *NATURAL KINDS*. BL level ranks the second in R2. Though SUBL naming has always the lowest figures, relatively high rate it reaches is specifically worth mentioning in the *EVENT/ACTION* categories. One thing that is obvious that the *EVENT/ACTION* category figures are much more balanced than the other categorical groups.

Kruskal Wallis test has been used to see if the differences between the categorical groups are significant. According to the test results;

- In R1, the difference between categorical groups is significant.
  ($\alpha = 0{,}05$, $p < \alpha$)
- In R2, the difference between categorical groups is significant
  ($\alpha = 0{,}05$, $p < \alpha$)

5.DISCUSSION

As far as the familiar categories (in R1) are concerned, the participants' tendency to name them in BL proves the usefulness of BL categorization although R1 pictures are also easy to name in SUBL. We strongly anticipate that even preschoolers do know what "chocolate ice cream" is as a lexical category and can utter the word form as it is. In spite of that, most of the participants elicited BL name "ice cream" instead of SUBL name "chocolate ice cream". That is, as we quoted from Taylor (*Cognitive Grammar* 131) previously, unless a more detailed one (e.g. SUBL) is necessary, the participants tended to name the pictures in BL. Although they are the most salient and privileged ones, BL categories still include generalizations to some degree in terms of meaning content. Using BL instead of SUBL indicates "one level upward rounding" categorically in the mental taxonomy. Here we use the term "rounding" to mean that they prefer a categorical level which is broader in content.

On the other hand, the category pictures that are difficult to name (in R2) urged the participants to think and decide hesitantly. In this case, informants were likely to feel themselves unsure about the precise naming. Thanks to their broad meaning content, SUPERL categories are useful for naming unclear objects or events in such

cases. They save us from making inappropriate namings. As opposed to R1, "two level upward rounding" (from SUBL to SUPERL) is the case R2.

It is seen that when the subjects feel uncertain about the categories, they tend to use the most inclusive level of naming level (SUPERL) to avoid taking risk of incorrect naming. As we stated above (in the Introduction part), naming the same entity in different categorical levels is possible. This might be a matter preference. This preference can be caused by context or lack of knowledge/life experience, which, we think, might motivate "categorical rounding". As Smith and Kossylyn (188) states *"…when people become expert in a domain, they become able to process lower level [i.e. SUBL] taxonomic categories as effectively as middle-level ones".*

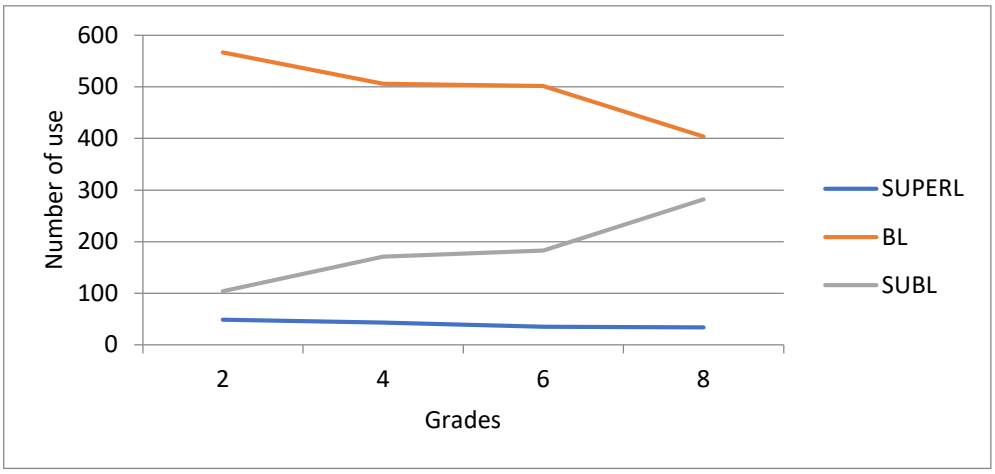
Our findings on BL are in parallel with what has already known about categorical levels. One of the main features of BL is that the names in this categorical level are the ones that are first retrieved from the memory. Löbner (185) states that BL operates faster than higher and lower levels in psychological experiments as is the case in our experiments. This was also the case for the informants of Rosch et al. that the subjects overwhelmingly used BL names in the free-naming experiment in Experiment 10.

The position of SUBL naming should be described in relation to BL. Although SUBL never had dominance in the naming tasks, there seems to be a kind of role exchange between SUBL and BL during the developmental course of children. As they get older and more knowledgeable, they attach more SUBL categories to the related BL taxonomically and they start to use SUBL names in place of BL when necessary. For this reason, there is an obvious correlation between SUBL and BL naming. At this point, it would be convenient to ask a question: Is there a clear-cut difference between elementary and secondary schoolers' results? Our answer is "Almost no". In the Turkish educational system, students start going to secondary school after graduating from the 4th grade of elementary school. It is seen that the categorization skills start to enrich significantly after the 2nd grade but there is not a remarkable change between the 4th and 6th grades. On the other hand, the 8th grade students, whose academic knowledge and life experience are at the maximum level in relation to the other grades differ particularly by the effective use of SUBL categories.

SUPERL categories are directly related with cognitive skill of "making generalizations". To be able to do this, children should have enough knowledge regarding the common attributes of the category and this is challenging to some extent. To illustrate, naming a piece of chocolate cake as "pastry" can be easy for an

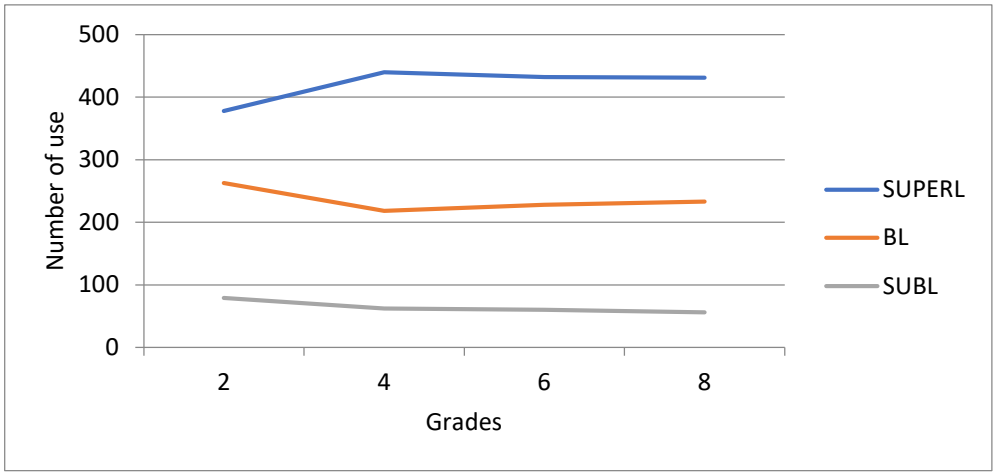
adult but more difficult for an eight-year old child. The positive effect of formal learning on SUPERL categorization skills is clear as R2 results show. Second-graders already have some knowledge concerning SUPERL but this improves considerably at the 4th grade and goes almost steadily for the rest of the school life.

When R1 and R2 results are evaluated in a developmental course, a noticeable change is seen after the 2nd grade. The change slows down between the 4th and the 6th grades and accelerates again between the 6th and 8th grades. Distribution of the categorical levels and developmental change across the school grades could be interpreted better by line graphs. Line graphs 1 and 2 reveal a strong mirror symmetry between certain categorical levels. For example, the mirror symmetry between SUBL and BL is easily noticed in Line graph 1, which means while the number of SUBL naming rises, BL naming decreases in the developmental course (as the age/grade increases). SUPERL line, on the other hand, goes almost steadily.



Line graph 1- Correlation between class grades and categorical levels in R1

We come across a similar mirror symmetry in R2 below. This time, so called symmetry is between SUPERL and BL. The change between the 2nd and 4th grade scores is easily noticeable. This means that linguistic performance regarding SUPERL categories also increases by age.



Line graph 2- Correlation between class grades and categorical levels in R2

It is obvious from the database that the subjects, to some extent, produced category names peculiar to childhood period. Such kind of lexical categories are temporal, i.e. belong to a transitory period. Some examples from the database like "Araba sürüyor" (She rides car) for R1-11; "Örümcek" (Spider) for R2-2; "Piyano" (The piano) for R2-5 and "Keman" (The violin)" for R2-6 sound odd, though they have low prototypicality. Lack of knowledge and life experience are probably the main causes of such inappropriate namings.

Markman (5) draws attention to the categories children create in the early years of their life and asks an important question: How is it, then, that children quickly arrive at what we do consider to be reasonable categories though their categorization is sometimes found peculiar, incomprehensible or useless at first by the adults? According to Clark (476-477), as they master the conventions of their language, children make use of child-directed speech, offers of words and constructions, and adult reformulations of child errors.

Önal also proved that elementary and secondary school students are prone to create odd categories, which he called "child categories". That is, children adopt the adult lexical categories in their culture and native language in due course.

As for in which categorical group the subjects store more detailed knowledge, we see that they are more familiar with the *ARTIFACTS* than the *NATURAL KINDS* and *EVENT/ACTION* categories. This result might be taken as a result of the urban life style that not only the children but also the adults are in closer relationship with the artifacts such as *ice cream, glasses, watches, vehicles, computers,* etc. than *NATURAL KINDS* like *tree, insect, animal,* etc.

EVENT/ACTION category results have some peculiarities. Contrary to the other categorical groups in R2, we see less SUPERL and BL and more SUBL naming. That means, *EVENT/ACTION* categories do not yield as much difficulty as the other categorical groups or they may be more open to individual interpretation in terms of naming. Such categories have more complex inner structure in which many components are involved in terms of "whole-part relationship". Think of a scene of *wedding ceremony* where a bride, a groom, close relatives and guests in elegant clothes, an orchestra, music, dance, food etc. take place in special physical setting. It gives us a very rich picture in terms of the components. Many questions about the events or the actions can be asked starting with *what, who, when, where, how, how long*, etc. Contrarily, a *flower* is always a flower (or a kind of it) whether it is in a garden, in a pot or in a vase and it does not yield such a complex inner structure.

6.CONCLUSION

To sum up, this research has come up with important findings on what elementary and secondary schoolers know about categorical levels and also how they use them to name the categories. They organize most of their knowledge in BL categories and can easily retrieve and use them. When necessary, they are able to use categorical levels other than BL. For example, SUPERL lexical categories exist in their categorical structure and they are capable of using them when it is necessary to make generalizations. Even the second-graders are aware that inclusive meaning content of SUPERL categories can save them from making mistakes in terms of naming. SUBL categories, on the contrary, are highly dependent on life experience and they get more salient as the age increases.

By school age, children take on the role of "student" and begin to have much more interaction with people from various ages, thereby gaining social experience. For them, a new learning phase called "formal learning" starts as well. Needless to say, most of the learning occurs through language. Children learn numerous categories/concepts from various fields such as language, math, science, geography etc. during the elementary and secondary school period. Any sort of media should be taken into account in terms of their contribution to learning as well. As Carroll (304) states language is the predominant means of instruction in a wide variety of subject matters and the language of the school is different from that of the home and playground. Formal learning merges with the late mother tongue acquisition as the students are still children who have social interactions outside the school. They are still engaged in daily activities like playing games, doing sports and going to the

cinema. Through formal or social learning, children have to organize the newly learned/acquired categories through linguistic system. Categorization as a multifaceted cognitive skill has a very important role in structuring the world knowledge. It is also directly related with the linguistic competence since the world knowledge, culture and experience are the integral parts of the linguistic system. Categories are inevitably labeled or named linguistically, therefore naming is also an important aspect of cognitive and linguistic system.

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Appendix I: R1 and R2 general database (partial)

Student	Grade	School code	Sex	R1	R2	R1	R2
1	8	1	M	ARI-*bee*	OT-*plant*	BL	SUPERL
				ELMA AĞACI-*apple tree*	BÖCEK-*insect*	BL	SUPERL
				KÖPEK-*dog*	BALIK-*fish*	BL	SUPERL
				SİYAH ÜZÜM-*black grapes*	KUŞ-*bird*	SUBL	SUPERL
				GÖZLÜK-*glasses*	MAKİNE-*machine*	BL	SUPERL
				DONDURMA-*ice ceram*	MÜZİK ALETİ-*musical instrument*	BL	SUPERL
				GÖMLEK- *shirt*	EŞYA-*ware*	BL	SUPERL
				SAAT-*watch*	RADYO-*radio*	BL	BL
				ÇİZGİFİLM İZLİYORLAR-*they watch cartoon*	OYUN OYNUYORLAR-*they play game*	SUBL	SUPERL
				ALIŞVERİŞ YAPIYOR-*she does shopping*	TAMİR-*repair*	SUPERL	BL
				BİSİKLET SÜRÜYOR-*she rides bike*	YEMEK-*meal*	BL	BL
				YEMEK YİYOR-*he eats meal*	SPOR-*sport*	BL	SUPERL
2	8	1	M	ARI-*bee*	OT-plant	BL	SUPERL
				MEYVE AĞACI-fruit tree	KARAFATMA-*cockroach*	SUBL	BL
				KÖPEK-dog	BALIK-fish	BL	SUPERL
				ÜZÜM-*grapes*	KUŞ-*bird*	BL	SUPERL
				GÖZLÜK-*glasses*	KAĞIT MAKİNESİ-*paper machine*	BL	BL
				DONDURMA-*ice cream*	VURMALI-*percussion*	BL	SUPERL
				GÖMLEK-*shirt*	TELEVİZYON-television	BL	BL
				SAAT-*watch*	RADYO-*radio*	BL	BL
				ÇİZGİFİLM İZLİYORLAR-they watch cartoon	OYUN OYNUYORLAR-*they play game*	SUBL	SUPERL
				MEYVE ALIYOR-*she buys fruit*	TAMİR EDİYOR-*he repairs*	BL	BL
				BİSİKLET SÜRÜYOR-*she rides bike*	EKMEĞE ETDÜRÜYOR-*he wraps the meat*	BL	A
				SANDVİÇ YİYOR-*he eats sandwich*	JİMNASTİK-*gym*	BL	BL

Appendix II: Typical namings, their frequencies and categorical levels

Namings elicited for R1 categories	*(%) - related categorical level*
ARI (Bee)	28,75- BL
Arı kovanı (Bee hive)	14,16-BL
Arı bal yapıyor (The bee makes honey)	10,83-BL
ELMA AĞACI (Apple tree)	58,71-BL
Ağaç (Tree)	18,33-SUPERL
Meyve ağacı (Fruit tree)	8,33-SUPERL
KÖPEK (Dog)	63,75-BL
K9	10-SUBL
Alman kurdu (German wolf dog)	4,85-SUBL
ÜZÜM (Grape)	53,33-BL
Siyah üzüm (Black grapes)	33,33-SUBL
Üzüm salkımı (Bunch of grapes)	6,25-BL
GÖZLÜK (Eye glasses)	56,66-BL
Güneş gözlüğü (Sun glasses)	37,5-SUBL
Siyah gözlük (Black glasses)	2,91-SUBL
DONDURMA (Ice cream)	59,58-BL
Külahta dondurma (Ice cream in cone)	13,75-BL
Çikolatalı dondurma (Chocolate ice cream)	12,5-SUBL
GÖMLEK (Shirt)	61,25-BL
Beyaz gömlek (White shirt)	17,91-SUBL
Tişört (T-shirt)	5,41-BL
SAAT (Watch)	52,50-BL
Kol saati (Watch)	42,08-SUBL
Siyah saat (Black watch)	3,33-SUBL
ÇİZGİFİLM İZLİYORLAR (They watch cartoon)	54,58-BL
TV izliyorlar (They watch tv)	33,33-SUPERL
Film izliyorlar (They watch film)	7,91-BL
SEBZE ALIYOR (She buys vegetable)	27,08-BL
Alışveriş yapıyor (She does shopping)	23,33-SUPERL
Meyve alıyor (She buys fruit)	19,16-BL
BİSİKLET SÜRÜYOR (She rides bike)	93,33-BL
Araba sürüyor (She rides car)	1,25-BL
Sokakta bisiklet sürüyor (She rides bike in the street)	0,41-BL
YEMEK YİYOR (He eats meal)	62,50-BL
Sandviç yiyor (She eats sandwich)	10-SUBL
Ekmek yiyor (She eats bread)	3,33-SUBL
Namings elicited for R2 categories	*(%) - related categorical level*
OT (Plant)	27,08-SUPERL
Bitki (Plant)	12,91-SUPERL
Çimen (Grass)	12,91-BL
BÖCEK (Insect)	52,91-SUPERL
Hamamböceği (Cockroach)	18,33-BL
Örümcek (Spider)	14,58-BL

Appendix II (Continued)

BALIK (fish) Akvaryum balığı (Aquarium fish) Japon balığı (Gold fish)	60,83-SUPERL 8,75-BL 5-BL
KUŞ (Bird) Mavi kuş (Blue bird) Ağaçta kuş (Bird in the tree)	68,33-SUPERL 15,83-SUPERL 2,5-SUPERL
MAKİNE (Machine) Matbaa (Printing machine) Piyano (The piano)	32,91-SUPERL 7,5-BL 5,41-BL
MÜZİK ALETİ (Musical instrument) Çalgı (Musical instrument) Keman (The violin)	57,08-SUPERL 5,83-SUPERL 3,33-BL
MOBİLYA (Furniture) Eşya (Ware) Ev eşyası (House ware)	20,83-SUPERL 15,41-SUPERL 9,16-SUPERL
BİLGİSAYAR KASASI (Computer box) Radyo (Radio) Makine (Machine)	16,25-BL 13,75-BL 4,58-SUPERL
OYUN OYNUYORLAR (They play game) Kutu kutu pense oynuyorlar (They play KKP) Halay çekiyorlar (They play the halay)	66,24-SUPERL 15,41-BL 3,75-BL
TAMİR EDİYOR (He repairs) Musluk tamir ediyor (He repairs the tap) Su tesisatı tamir ediyor (He repairs the plumbing)	46,65-BL 13,75-SUBL 4,58-SUBL
YEMEK YAPIYOR (He cooks) Sandviç yapıyor (He makes sandwich) Ekmek arası yapıyor (He makes sandwich)	32,47-BL 18,75-SUBL 6,25-SUBL
SPOR YAPIYORLAR (They do sports) Jimnastik yapıyorlar (They do gym) Egzersiz yapıyorlar (They do exercise)	79,57-SUPERL 5,41-BL 3,33-BL

Appendix III

R1

Picture 1

Picture 2

Picture 3

Picture 4

Picture 5

Picture 6

Picture 7

Picture 8

Picture 9

Picture 10

Picture 11

Picture 12

R2

Picture 1

Picture 2

Picture 3

Picture 4

Picture 5

Picture 6

Picture 7

Picture 8

Picture 9

Picture 10

Picture 11

Picture 12