

# Developmental Differences in the Construction of Concepts by Children from 3 to 14-Year-Olds: Perception, Language and Instruction

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**Abstract**—This study was designed to investigate the relationship between language and children’s construction of the concept of objects, actions, and states. Participants of this study are 120 children whose ages range from 3 to 14 years. Ten children participated from each age group and 10 adults participated as normative group. Data were collected using 28 words which were identified and grouped according to the purpose of this study. Participants were asked the question “What is x?” for each word in a reserved room. The audio recorded data were transcribed and coded. The data were analyzed primarily qualitatively but quantitatively as well to support qualitative findings. The findings reveal that younger children rely more on their perceptual experience and linguistic input while 7-year-olds and older ones rely more on instructional language in the construction of the concepts related to objects, actions and states. Adults differ from all age groups with their usage of metaphors to refer to objects. It has been noted that linguistic, perceptual and instructional experiences work in an interwoven way but each one seems to be dominant at certain ages.

**Keywords**—Cognition, concept construction, first language acquisition, language, thought.

## I. INTRODUCTION

THE vexed question on whether language is a byproduct of thought in the sense that human beings develop language because they possess the ability of generating thought (Piagetian view) and the need to transmit this thought to others (Bruner’s view) or linguistic ability is an autonomous system which develops in the way genetic nature of human species renders (Chomskyan view) and which contributes to the construction of thought itself has been going on for almost half a century<sup>1</sup>. The proposition claiming that children construct their conceptual world through their perceptual experience with(in) their immediate environment [1], [2] and then they map the constructed concept, namely, semantics, on linguistic elements such as words and larger structures, necessitates the proposition “children experience, perceptually, anything the concept of which they possess” to be true. One of the questions to be answered is whether children really construct all the concepts they possess through their perceptual experience or whether they construct part of

their conceptual world in the way the child’s mother tongue describes the close environment. Another question to be answered is “Do the concepts constructed through perceptual experience remain the same when they are once transformed into symbolic entities via language?” That is, is the final quality of the concept of “dogness” at a given time equal to the dog(s) which the child has perceptually experienced until the “deictic now” of that time or does it gain new features when this experience is articulated [4]?

The features to be picked up through perception are not static and nor is the mental nature of the perceiver, which influences the process of perception. Both the perceived and the perceiver are always in a state of capricious flux. Piaget and Chomsky occupy the two opposite ends in this discussion to its most extremity. A considerable amount of effort has been allocated for the investigation of this evolving quality and quantity of conceptual construction by various researchers [2], [3], [5] to bring these ends closer, if not together. Along with considering other minor factors, the bulk of the research is concentrated on cognition and language with an empiricist and nativist understanding; however the matter is not bi-polar but must have three poles if they can be referred to as poles where the third one is *instruction*. Although the instructional language at school contains both perceptual and linguistic elements, it still diverges from each of them. Compared with the former, it presents the things to be experienced in scrutiny that would otherwise be impossible to perceive. As for with the latter, it organizes language in the forms of definitions, descriptions, hypotheses, propositions and conclusions which organize *the experienced* in a relative hierarchy in a web of schemata in the mind. While instructional environment tailors language in the conceptualization of observable and unobservable, the instructional environment is shaped by language as well.

Piaget scrutinized the cognitive side of the question concerning with how cognition is a factor in the construction of concepts. He proposed that object perception and learning the nature of objects are the basic stages of the interaction with the immediate environment for children. As Piaget puts it, “a child in the sensory-motor period assimilates the external environment to his own activities [1]” and then he constructs the non-linguistic concept of these experiences. For instance, as [5] reports, a newborn is more likely to prefer to nurse from the left breast of the mother and to fall asleep there during breast-feeding since the newborn perceives the heart beats of the mother and then creates the concept of *security* or

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<sup>1</sup> The debate between ‘*universalist*’ and ‘*relativist*’ understanding is different from the debate we introduced above in that universalist idea holds the belief that language is shaped by universals of human cognition and the relativist idea proposes that variation in the parametric features of varying languages influence the cognition of its speakers [3].

*comforting*; it is obvious that it is something different from the thing it perceives while nursing from the right breast. In the course of both biological and cognitive maturation, the child begins to build schemata of his own, a kind of microcosm which constitutes the web of his relational world and then extends to the world of the *other* when the child reaches the period of formal operations [6].

Related to the impact of language on the construction of concepts, this research has no intentions to bring forth the claim which proposes that different communities having different languages conceive of the world in the way their language dictates them. Instead, we propose that linguistic representative reshapes *the perceived* in the process of transforming it into a concept. To clarify this, assume that a person is appreciating the beauty of a valley full of trees and green fields. This person can do it without relating anything under observation with their linguistic representatives. Once an accompanying person utters the expression “Oh, beautiful!” the nonlinguistic beauty, which the person was enjoying is framed by the concept of *‘negotiated beauty’* the person had constructed until the time of the utterance. So, at the very time of the utterance, the experienced is reshaped by language.

In other cases, the only way a child may have access to something may be via its linguistic coding. Along with the names of external, and thus, observable organs, children hear the names of internal organs as well. All of the internal organs do not beat as *heart* does. How would a child construct the concept of *liver*? It cannot be felt (one can feel the ribs) and it cannot be perceived at all if the child is not exposed to an image or model of it. In this case the child will trust the linguistic encoding of that thing and will create the concept of such a thing in the way language forms it. One of the participants in a preschool had asked the researcher saying “Sir, they say that my brain does not work. Does our brain have hands and legs to work? This question reflects that the child’s imagination of an internal organ is framed by the semantic scope of the word *work* which is constructed, probably, in analogy with the observable form of the act of *working* of a person.

As for the instructional domain, children are presented packed information, not based on *a posteriori*, covered by curriculum rather than constructing the packs by themselves. The largest amount of this package is transmitted to the child through language. The de-packaging and assimilation of the package and then the accommodation of the relevant schemata occur in the way and to the extent language is processed by the child. While the content of the package, in the form of objects, images, actions and states, constitutes the things which address to the perceptual receptors of the learner, language functions to reconstruct these perceived entities via linguistic modifiers viz adjectives, adverbs or the thematic role of the uttered word such as being an agent, patient, theme etc. Language also establishes connections among those perceivable entities via prepositions (in English) encoding the goal, source, location etc.

The theoretical framework for this study is based on the question how ‘minimal syntactically functioning units’, as

proposed by [7], are organized by different age groups to construct larger well-formed units to communicate the conceptual entities, as proposed by [8]. Within this theoretical framework, the aim of this study is to find an answer to the question how children reflect the conceptualization of some certain objects, actions or states in their stimulus-driven language. We assume that their reflection will yield some clues about how language is in interplay with thought which is based on another assumption claiming that their linguistic production is rooted in their thought (at the stage of language production) which itself is, partially, rooted in linguistic input (at the stage of language processing).

## II. METHODOLOGY

### A. Participants

Participants of this study are 120 children whose ages range from 3 to 14 years. Ten children participated from each age group and 10 adults participated as normative group. Although the study is not going to be concerned with gender differences, we involved five girls and five boys in each age group. Children until the age of 6 attend to kindergarten, 6-year-olds attend to preschool and children from 7 to 14 years of age attend to elementary school. Children who attend to the kindergarten where the data were collected come from similar socio-economic status families; they are the children whose both parents work in a state office or schools. Children who attend the elementary schools where the data collected come from families who render more diverse socio-economic status. However, they are neither too poor to access basic form of education nor so rich to take private education from prominent educators. Thus we assume that socio-economic status is not a factor in the production of the data. The participants of the normative group are between 20 and 30 years old university students.

### B. Data Collection

In order to elicit data, participants were given 28 words and they were asked to define the word on the card (e.g. “What is *father*?<sup>2</sup>). The words included were identified according to the assumed nature of the relationship a person might have with their referents. For instance, a child sees stars and the sky, that is, they experience them visually but they cannot have an audio, kinesthetic or tactile sensation of them. Hence, the perceptual experience they are to have with such objects must not be the same as the experience they have with their parents or a pencil. Within the framework of this relationship, we assumed that more of their conceptualization related to such words as *star* or *sky* will be constructed by linguistic information to be provided with the children by caregivers, teachers, books or peers. According to our criteria, following

<sup>2</sup> It is possible to remove the article *a/an* from the Turkish counterpart of the question ‘What is *a/an x*?’ even if the noun is a countable one. This removal frees the noun from the bias of having a nature of countability or uncountability, which is a factor in the conceptualization of the item. Thus we, purposefully, removed the article *a/an* in English questions in this paper for the sake of neutrality about countability or uncountability though we are aware that it is ungrammatical.

list of words was identified. These words refer to

- some objects which a person can manipulate to perform certain simple tasks taking them in hand: *pencil and knife*,
- some kinship relations: *sibling (equal), mother and father (hierarchical)*,
- some objects which one can see but cannot touch: *sky and star*,
- an action: *to sleep (passive agency), to run (active agency)*,
- a state: *to get ill (physiological), to get sad (psychological)*,
- objects which are part of a larger object: *wheel, window, and leaf*
- objects which are eaten: *bread and apple*,
- objects which are part of human body: *hand, foot (open to human sensation), brain (closed to human sensation)*,
- objects which people ride and travel: *plane and car*

In order to determine some of the words to be included, we administered a pilot test to 10 and 20-year-olds. These words are the ones which may or may not be conceived of as related to one another, viz. *star, plane and sky*. In this pilot test, we presented the piloting participants a group of 10 words and they were asked to identify two words which would best match the qualities or functions with which we describe the object. For instance, the pilot participants were given the words, *sun, meteor, cloud, star, bird, kite, plane, helicopter, missile, satellite*. They were instructed as, "It is something you can see in the sky but you cannot touch." Within this group, seven 10-year-olds out of ten and eight 20-year-olds out of ten marked the words *star* and *plane*. Some of the words such as *father, mother, foot, leg, hand* and *wheel* were determined by the researcher since testing the conception of objects that are part of a larger unit, viz. *wheel* (part of a car), or *hand* and *foot* (part of body), is one of the aims of the study. Before the start of data collection, the researcher visited the kindergarten three times in two weeks and played some games with the children at relevant ages to establish familiarity to overcome the possible feeling of insecurity in children. Data were collected from each child individually within a reserved room where occasionally the teachers accompanied until it was certain that the child fully felt secure and comfortable. Data were elicited during a game designed by the researcher. The game is called "What is What?" Children were motivated with the question "Shall we play 'What is What' game?". This question was posed partly to test the willingness of the child. The researcher designed cards on which different words are written. The cards were placed on a side table placed between the child and the researcher as their word containing sides face down. The researcher explained the rules of the game to the child saying that "Each of us is going to pick up a card from the pile in turns and see what word is written on the card". When it is the child's turn, the researcher reads the word for the child saying some *encouragers* such as "Ahha, you picked up a very nice word: *pencil* (in Turkish). Okay please tell me. What is *pencil*? Not 'a pencil' purposefully. Upon hearing the answer and being sure that the child finished his definition/description, the researcher said some rewarding phrases such

as "Very well done!" or "High five"

The game did not work with elder ones (eight-year-olds and older ones) and thus we asked them the questions directly by picking up a card and asking what the thing is. All of the participants heard the words exactly in the same order. The whole process of data collection was audio recorded using two recorders to secure the recording.

### C. Data Processing and Data Analysis

All of the audio data were transcribed by the researcher. 20% of the data were transcribed by two more transcribers who were trained for a short period of time. By this way the reliability of transcription was assured. The agreement between the transcribers was 99.89%. The parts that were not agreed upon even after negotiation were removed from the data set. They were a few noise-interfered words.

Data were analyzed both qualitatively and quantitatively in a comparative way across ages and within age groups to find out *how language and thought are interrelated in the construction of one another* in general but what perceptual, cognitive and linguistic tools children use to construct concepts in particular.

## III. FINDINGS

Studies [9], [10] reveal that children conceptualize external world and construct concepts through three major types of experience: perceptual experience, linguistic experience and instructional experience. All of these types of experience work together to contribute to momentarily form of any concept; which is subject to change with the slightest change in any of these experiences. Our findings detail these three categories by demonstrating that each of these experience types becomes dominant in the conceptualization of specific states, events or objects although other types of experiences are also influential in almost all cases of concept construction and how children reflect their concepts in their verbal production. Within the limits of our study, the data showed that children make use of the situational relations between the thing under focus and other things; cause-effect relationship; the concept constructed by linguistic input; and description and definition. Adults were observed to use metaphors. In order to ease the processing of the findings, they are presented in the abovementioned categories.

It was observed that some successive age groups rendered data showing similar qualities. Thus, instead of presenting the findings for each age group, we will present the findings of the age groups which make up a developmental turning point. Three-year-olds will be discussed in details to construct a base on which all included age groups can be compared and constructed. Hence, after the completion of the analysis of 3-year-olds' utterances on each base, there will be a subheading reporting significant changes developmentally. Figures will only be provided when there is a developmental turning point for the sake of brevity.

### A. Conceptualization of External World through Perceptual Experience

Perceptual experience refers to a child's constructing the concept of something on the basis of the input received via five senses without the interference of language or instruction. It may either be a direct experience in which the speaker experiences the situation or vicarious one which means that the child might have observed the situation on another person. "They had vaccinated me. It hurt and I cried" is a direct experience and "My sister had a shot in the hospital. She cried

too much." is vicarious learning where the child constructs the concept of *shot*; 'shot hurts'.

#### 1) Situational Relations

The findings presented under the category of *relations* were subtitled so because the participants answered the questions 'What is x?' by referring to an object, state, event or concept which is in a situational relation with x in the question. For instance the question 'What is pencil?' was answered as 'to write/writing.'; or 'What is chair?' received the reply 'table' or 'to sit/sitting.'

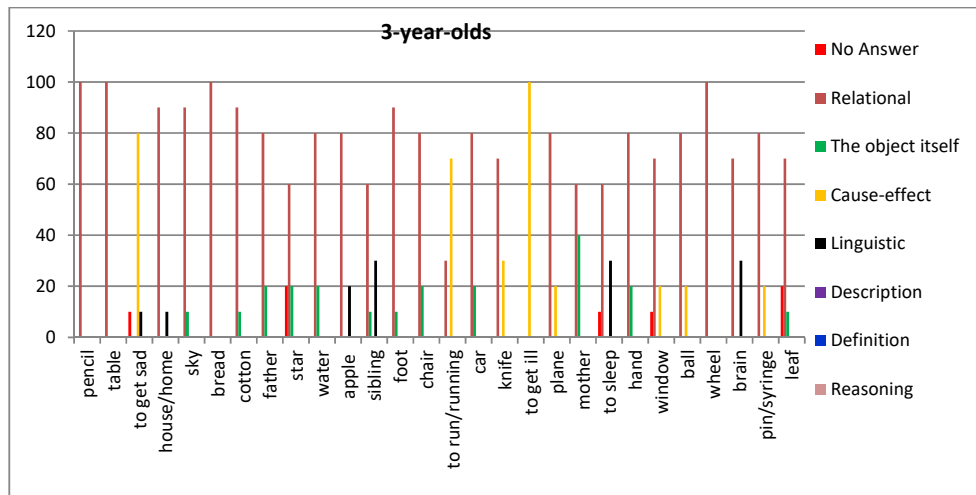


Fig. 1 Quantitative features of response types by 3-year-olds

In general terms it is observed that answering the question 'What is x?' by referring to a related thing decreases with increasing age. When items are analyzed individually, some of them had higher references to related entities than others. The qualitative analysis of individual items reveals that underlying reasons for referencing vary for various items. For instance, all of the 3-year-olds uttered the phrases 'to eat' 'to have breakfast' or 'to eat soup' when they were asked the question 'What is bread?' It is, to a great probability, because of the priming from *bread* to *to eat*. After seeing this finding, we expected *table* to activate *chair* since in Turkish these are the two words that are used in the sequence of 'table-chair' when a social event in which tables and chairs are required. Nevertheless, it is observed that, rather than linguistic priming, perceptual experience is observed to be more influential in the conceptualization of *table*. In 3-year-old group, 80% of the participants uttered the act of having dinner/lunch, studying or the names of the entities such as notebook, book, plate, spoon and fork which are visually accessible on the table.

The objects *window*, *wheel*, *hand* and *leaf* are the parts of whole objects such as a *house*, a *car*, a *body* and a *tree*. At the beginning of the study, we assumed that 3-year-olds would reflect the conceptualization of the objects *window*, *wheel*, *hand* and *leaf* by referring to the *whole* or another part of the *whole*. Contrary to our prediction, 3-year-olds related all of these four objects with the actions applicable to each of them.

Although 20% of them related *window* to *house*, and 10% to *door*, 70% of them related it to 'looking outside' or 'opening it'. As for *wheel*, it validated our assumption to some extent but, when they were prompted with the question 'What is wheel?', 60% of the 3-year-olds uttered the word *rolling* or *rotating*, or they related it with the act of *mounting* to a car or plane. As for *hand*, children uttered the conditions in which we use our hands such as *holding*, *fighting* or *washing*. *Leaf* is related with *branch* or *tree* itself by 40% of the 3-year-olds while 60% of them related it either with the act of *falling* or *blowing* (in relation to wind).

The quantitative analysis of the utterances which answer the questions containing entities which one can see but cannot touch, namely *sky*, *star* and *plane*, by 3-year-olds showed that a great majority of the participants attempted to explain them relationally; 90%, 60% and 80% respectively. As for the qualitative analysis, 3-year-olds were observed to have two different conception of the sky: *container* and *source*. A great majority of them uttered the names of the entities which can be seen in the sky. The sun, clouds, stars, the moon, rainbow, rain and snow are the words they uttered to answer the question what *sky* is. When they utter the entities the sun, the moon, stars and clouds, they attribute the sky the quality of container. In this conceptualization both container and the container are stable. When they relate it with rain and snow, they conceive the sky as a source since both rain and snow fall

from the sky and in this case there is a dynamicity of snow and rain which is extended to the source as well [11]. Two of the participants made it clear saying “Snow comes from there.” and “The sky gives us rain.” As for *star*, it was mentioned as an element of black or dark sky and it was related with evening and the moon.

The question what *plane* is received answers as ‘Flying to Antalya.’, ‘Flying in the air.’, ‘It takes us to Izmir.’, ‘You show a ticket’ or ‘My mother and I had gone to Istanbul in the plane.’ along with the responses just mentioning a related action such as *falling* or *flying*. These responses are different from the ones we elicited for *the sky* and *stars* since the 3-year-olds approach the object *plane* with a proximal understanding probably because of the occasional palpability of the object *plane*.

*Bread*, *apple* and *water* are the objects eaten or drunk. A great majority of 3-year-olds (70%) responded to the questions asking what *bread* and *apple* are by uttering the act of *eating* while other 30% mentioned either the act of *cutting* or *breakfast*. The stimulus *water* urged children to respond with the act of *drinking* and a very few of them with *washing* or *swimming*. These responses imply that 3-year-olds conceive of food and drink egocentrically; they narrow down the conception of these objects to the things which we either eat or drink without taking their nature and their relation to other things into consideration. They reflected this egocentric approach in almost all of the items; one of the 3-year-olds responded to the question containing *hand* by saying “You hold like this./Sometimes it is useful while fighting./To open something./To hold the key.” However, the egocentric approach seemed to be stronger with food.

Kinship terms *mother*, *father* and *sibling* rendered answers containing the direct roles of each kin to the 3-year-old children. The data show that the conceptualization of the family members has the remarks of strong egocentric features. Most children referred to *mother* as *home maker*, *one who cooks*, and *one who loves me*; and *father* as *one who shouts at me*, *one who sits at home*, *one who eats a lot*, *one who drives the car*, *one who buys toys*, *ice-cream and chocolate*, and *one who works outside home*.

The question asking what *cotton* is contained references to syringe with a proportion of 90%. This is probably because all of the participants had been vaccinated until the age of 3 and during the injection children witness the usage of a piece of cotton to clean the spot to be injected in the arm. So, it can be argued that the conceptualization of cotton is based on their perceptual experiences. In Turkish, the word *igne* is used for both syringe and pin. Thus while 60% of the 3-year-olds related it with *syringe*, 40% of them referred to the act of *sewing*.

## 2) Cause and Effect

*Cause-effect* category was named so because participants focused on the possible outcome of *x* to explain what *x* is. As Fig. 1 demonstrates, only a few items were conceived of having an outcome by 3-year-olds.

The data analysis revealed that the act of running and the

act/state of sleeping are conceived in different ways. While *to run* is conceived as the cause of the act of *falling* or *bumping*, the conception of *to sleep* is reflected by referring to *bed*, *evening*, *tiredness* and *getting up early*. This implies that rather than their linguistic features, verbs’ perceptual features have an impact on 3-year-olds’ conceptualization of verbs. Our proposition is supported by the answers given for *pencil* and *knife* as well. Although both of them are the objects which can be taken in hand and manipulated, answers stating cause-effect relation emerged related with *knife* but not with *pencil*. This is because children either had a cut on their hand or finger while using a knife or they learned it vicariously while a pencil has not been observed to cause to a similar case.

A great majority of 3-year-olds reflected cause-effect relationship related to *to get sad* and *to get ill* in the forms of either causes or effects. While *to get ill* is the cause in the answer *to cough*, it is the effect in *to catch cold*. The 3-year-olds produced answers such as ‘to drink shrub (medicine), to take a shot, to stay in bed, to see a doctor, to sweat as the cause of *to get ill*. They produced the response *to run* as the cause of *to get ill*. The stimulus *to get sad* urged them to produce the responses such as *to cry/weep*, *to get food and parents’ leaving home for work* as the cause of *to get sad*. All of these mentioned cases are open to the observation of the child. Thus it can be proposed that the conceptualizations constructed through cause-effect relations are also based more on perceptual experience of the child.

## B. Conceptualization of External World through Linguistic Input

*Linguistic input* in this study refers to children’s producing utterances containing events, actions states, objects or images which do not seem to be possible to be experienced by the child but exist in their utterances as linguistic representations only.

The word *house/home*<sup>3</sup> was included in this study to test the metaphoric production relative to age groups. All age groups used a metaphor to refer to *house/home* once or twice. However, they all used the same Turkish word *yuva*, which literally means *nest*, to refer to *house/home*. Whether young children use this word metaphorically or they use it simply by copying from environment is questionable since metaphoric reference to other entities was not observed until the age of 11. Eleven-year-olds used another metaphor to refer to *house/home*; (literally) *life triangle*. Thus, we considered the usage of the word *yuva* by younger age groups to be more *linguistic imposition* of the environment than being a metaphorical conceptualization. Of course it cannot be said that the nature of metaphor is the same in all age groups. It would accommodate more metaphorical features with increasing age [12], just as the case in ‘some birds are *birdier* than other birds’ in the continuum from a penguin to a pigeon.

The words *apple*, *sibling* and *brain* also urged children to produce responses reflecting linguistic conceptualization. Two 3-year-olds stated that “Apple contains vitamin C.”, something

<sup>3</sup> In Turkish the word *ev* is used for both of the words *house* and *home*.

which cannot be experienced. For the word *sibling* one said “I have a sister. She is at the age of zero.” and another for the word *brain* “It makes you more intelligent when you eat it.”

### C. Conceptualization of External World through Instructional Experience

*Instructional experience* in this study refers to children’s being exposed to the language or application in which information is organized in such a way as to manipulate the mental and behavioral state of the child. For instance, stating the fact that water is made up of two moles of hydrogen and one mole of oxygen is considered to be an instructional experience, one which is not possible to experience with five senses. Though language is the primary audio or written input here, ordinary language must be differentiated from instructional language.

Three-year-olds are not given formal instruction in Turkey. Their utterances contain some informal instructive language but not at scientific level. For instance, the sentences emerged in 3-year-olds’ responses “You will grow up if you sleep.”, “Apple contains vitamin C.” “When a father dies, the mother takes care of the children.” may be considered the production of linguistic input; they might have heard them in daily life and they might have not been directed to the child. Along with being so, they also bear some features of information packaging because they contain generalized facts. This packaging makes them *instructional* because they are directed

to the construction of a desired behavior in general terms.

### D. Developmental Differences in Perceptual, Linguistic and Instructional Conceptualization

In the previous parts of the findings, we aimed to set a base to discuss how prompting words worked to urge the participants to reflect their mind internal forms of the entities in their utterances. In the following parts, the findings related to each word group will be presented on developmental bases.

Regarding the features discussed for 3-year-olds, 4 and 5 year olds do not show significant differences. Just like the case is for all other developmental features such as refinement in walking, running and talking, slight qualitative and quantitative improvement is observed with increasing age. A rough picture of the sentences produced by 5-year-olds is similar in length to those produced by 3-year-olds, though we did not calculate the Mean Length of Utterance (MLU). Most of the utterances produced by 5-year-olds do not make a full sentence because they are just one-word responses containing the name of an object or action which is related to the word asked in the question (see [13] and [14] to compare 3 and 5-year-olds in other linguistic aspects).

Beginning of the noticeable change is at the age of 6. While younger ages responded most of the questions relationally, 6-year-olds began to involve both descriptive and definitive approach to the conceptualization of the entities as Fig. 2 demonstrates.

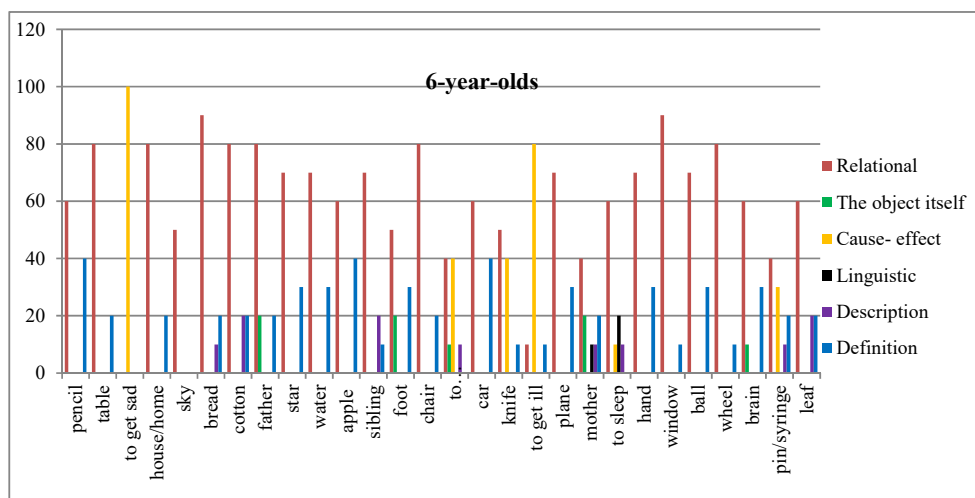


Fig. 2 Quantitative features of response types by 6-year-olds

None of the 3, 4 and 5-year-olds approached the objects with a definitive approach to the extent mentioning what the thing is. They uttered the word *thing* which itself is indefinite. For instance “A pencil is a *thing* which we write with.” while it turned out to be “A pencil is a *tool* with which we write.” in 6-year-olds though the definition is still proximal in the sense that the child relates the object directly with the act of “her/his writing”. Despite these improvements, 6-year-olds still preserve the understanding of relationality; as Fig. 2 shows, they respond to the questions by uttering the name of a related

object.

It was found that 3, 4 and 5-year-olds conceive of verbs on the basis of what verbs cause. It is usually in the form of “VERB causes a STATE or an ACTION”.

Six-year-olds conceive of the states *to get ill* and *to get sad*, and the action *to run* on the basis of cause-effect relationship (see [9]) in a similar quantity to younger ages. However, there are qualitative differences in the conceptualization of these entities. The form “X causes Y”, observed in 3, 4 and 5-year-olds transforms into “X is the result of Y” at the age of 6 as it

is shown in Table II.

TABLE I

X CAUSES Y (VERB CAUSES A STATE OR AN ACTION) BY 3, 4 AND 5-YEAR-OLDS

to get sad	causes	to cry/weep, to be sullen
to run		tiredness, sweating, losing weight, falling
to get ill		seeing a doctor, getting a shot, coughing, staying in bed
to sleep		to grow up, relaxing

TABLE II

X IS THE RESULT OF Y BY 6-YEAR-OLDS (VERBATIM TRANSLATIONS OF THE TURKISH STRUCTURES ARE GIVEN HERE)

What is to be sad/sadness?	a- Sometimes somebody says something bad. Then we get sad. This is to get sad. b- When one of our personal belonging is broken, we cry.
What is to run/running?	c- When we want to entertain or when we are in a hurry, we run. d- If we are fat, we run to become fit.
What is to get ill/getting ill?	e- For example ... Let's say we got cold. Then we get ill/sick. f- When we play in cold weather, we get ill/sick.
What is to sleep/sleeping?	g- When we are too tired, we close our eyes and sleep. h- When it is night time, we go to bed and sleep.

It is also observed that if a six-year old takes the approach “X is the result of Y” with one verb, the same participant takes the same approach with other verbs as well. There are some 6-year olds (30%) who took the approach “X causes Y” with some of the verbs while the same child might take the approach “X is the result of Y” in others [15].

Children about the age of 6 differ from younger children regarding how they conceive of the objects in the sky. They reflect their conceptualization of three dimensional spatio-temporal positioning of objects in their language. Six-year-olds answered the question “What is sky?” as follows:

- (1) Sky is a place where there are clouds, the sun, stars and the moon (6;01f).
- (2) Sky is a blue object where there are stars, the moon, the sun and clouds (6;08f).
- (3) In the sky ... I don't know whether I should say “on it” or where? (7;00m)
- (4) It is the air where clouds, the sun, stars and the moon exist (7;11m).

The three examples, (1), (2) and (4) draw the picture seen in Fig. 3.

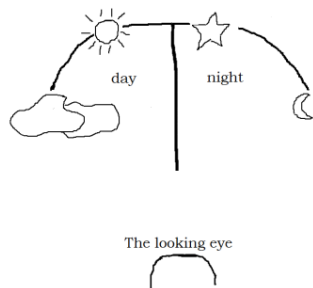


Fig. 3 Three-dimensional linguistic reflection of the concept of ‘sky’ by 6 and 7-year-olds

Children start to utter the name of the closest object, *cloud* and then *the sun*, which are the daytime objects. Then they focus on nighttime objects but not in the order of the daytime objects. From the furthest object of daytime, they move to the furthest object of nighttime, *stars* and then to the closest object of nighttime, *the moon*. Although the number of the participants produced this chain is three within the whole group, the fact that they mention these objects in the same order is still qualitatively significant. There is no reason for these children to be instructed, formally or informally, that these objects must be lined up on the syntagm in the way they did. So, the children’s organization of these objects in that way is the outcome of their perceptual experience.

Although a few of the 6-year-olds produced descriptions which reflect the distancing of the object or concept from the self of the child, it is observed that adult-level forms of *distancing* emerge around the age of 7. While the great majority of the children between the ages of 3 and 6;05 tend to define or describe objects or concepts in relation to their idiosyncratic experience with the object or concept, children between ages of 6;10 and 7;05 begin to define them by either relating them to other people or by referring to the defining features of the objects, such as “something sharp or something made from/of ...”. Such an analytic approach to an object must be the result of both instructional language itself and the final outcome of this language in the form of higher level conception of external world (5).

(5) What is (an) apple?

(Verbatim) (An) apple is a kind of fruit within other fruit types (7;02m).

In (5) the 7-year-old child focuses on the categorical features of the object and reflects that he is aware of the hierarchy in categorization; apple is a basic object which is within the framework of the superordinate form *fruit* [16]. This case does not allow us to speculate whether the conceptualization of *apple* is a linguistic, instructional or perceptual experience. However, this example bears strong implications showing that definitive form of language related to objects has gained dominancy over relational approach [17].

The real turning point from relational explanation to descriptive and definitive approach to talk about objects is around the age of 10.

As Fig. 4 demonstrates quantitatively, the relational and cause-effect based approach disappears around the age of 10 and they take a descriptive and definitive stance.

TABLE III  
DESCRIPTIVE AND DEFINITIVE APPROACH SAMPLES

<i>Descriptive approach</i>	
What is (a) pencil?	(a)- There is something when we want to write. It has lead.
What is brain?	(b)- For example they ask a question. We can answer it with the help of our brain.
<i>Definitive approach</i>	
What is (a) pencil?	(c)- Pencil is a <i>tool</i> with which we write.
What is brain?	(d)- The <i>organ</i> which enables us to think and to speak.

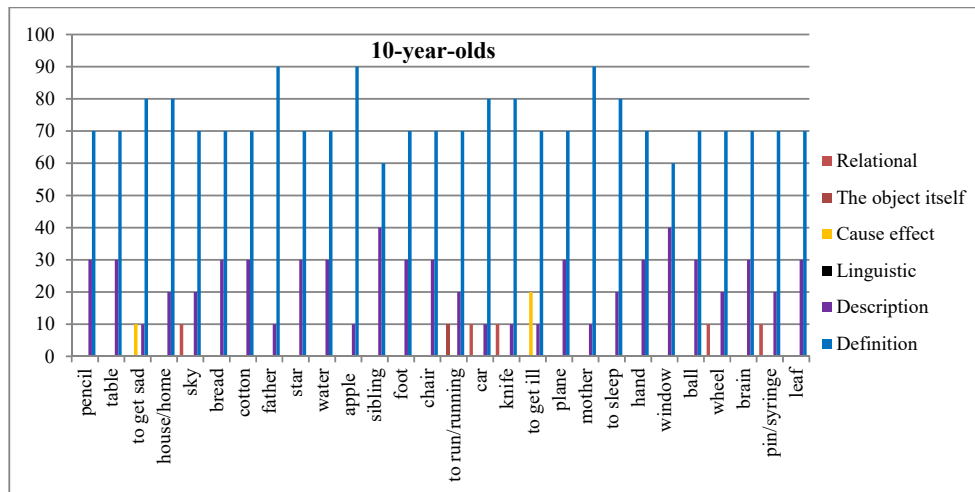


Fig. 4 10-year-olds' reflection of concepts through language

While younger children mostly approach the objects on the bases of their function, 10-year-olds include both structural features and function of the objects in their explanations.

- (6) A star is a light which has five corners. A natural light, that is, a source of light (10;03m).  
 (7) A knife is a sharp tool which is used to cut bread or other things (10;09f).  
 (8) A leaf is an organ of trees which helps trees to reproduce their food (10;07f).  
 (9) To get sad/sadness is a feeling. We usually cry when we are sad (10;02m).

In the explanations from (6) to (9) by 10-year-olds, it can be observed that this age group uses higher order cognitive skills in the presentation of their explanations. Ten-year-olds and older ones begin by stating what the thing categorically is and then they either detail the thing they are talking about or they mention the function of the thing. It is hard to claim that the descriptive and definitive approach reflected in the sentences (6)-(9) is the outcome of instruction since the children might have experienced those things perceptually. Contrary, the following examples elicited from 10-year-olds and older ones clearly demonstrate that they are the outcome of formal instructive language.

- (10) Water is one of our elements (10;08f).  
 (11) A leaf is one of the parts of a tree which enables the tree to get oxygen (10;04m).  
 (12) (Verbatim) Water is the life liquid of human beings and contains hydrogen and oxygen (11;09m).  
 (13) A leaf is a living thing which exists in trees and some of the plants and photosynthesizes for the plants (11;10f).  
 (14) Water is a molecule containing two hydrogen and one oxygen (11;10f).  
 (15) A leaf is a green structure which produces food thanks to the chloro... umm lokoplast and chloroplast it contains (11;10f).  
 (16) Siblings are two children having the same father and mother (13;04).

(17) A star is an object in the sky which reflects the light it takes from the sun (13;01m).

(18) Water ... umm I do not know how to define. Should it be scientific or in the way we see and use it (adult-24m).

(19) Brain is our basic organ which governs us both physiologically and psychologically (adult-22f).

The analysis of the sentences from (10) to (19) shows that each of them contains elements which cannot be experienced perceptually. Though it is possible to see a leaf, the observer cannot see or feel the leaf's getting oxygen (we are not concerned with scientific truthfulness of the propositions). If utterances bear clues related to the concepts in the mind, it can be argued that the concept of *water* contains hydrogen and oxygen as constituents. These constituents cannot be perceived while water's being liquid and transparent can be sensed. Thus, it can be claimed that the elements which cannot be sensed but exist as part or whole of a concept are the outcome of instructional language, mostly formal one.

The data revealed that 10-year-olds are not very different from adults regarding the approaching external world with a descriptive and definitive stance. However, adults differ from all other age groups with reference to the usage of metaphors. Four-year-olds produced metaphors to refer to *house/home* using the word *nest* in our study but [8] and [12] call such metaphors as 'child metaphors' which are the usage of the name of an object for a similar one or simulations in games. The usage of genuine metaphors does not begin before the age of 14 [18]-[12] though there is recent research claiming that it begins earlier [21]. Our data reveal that there seems to be a relationship between the usage of metaphor and the nature of the object/concept. Adults used metaphors in relation to *bread*, *mother*, *father* and *water* which are sine qua nons in one's life.

(20) Bread is, first of all a blessing/Godsent (in Turkish: *nimet*) for us (23m).

(21) Our father is our progenitor/ancestor (in Turkish: *ata*) (26f).

(22) Water is our life source (25m).



(23) Mother ... umm How can I tell? Words are insufficient to tell her (23f).

Only one of them stated explicitly that 'cotton is a metaphor

which symbolizes softness' which gives clues about their awareness of what metaphor is.

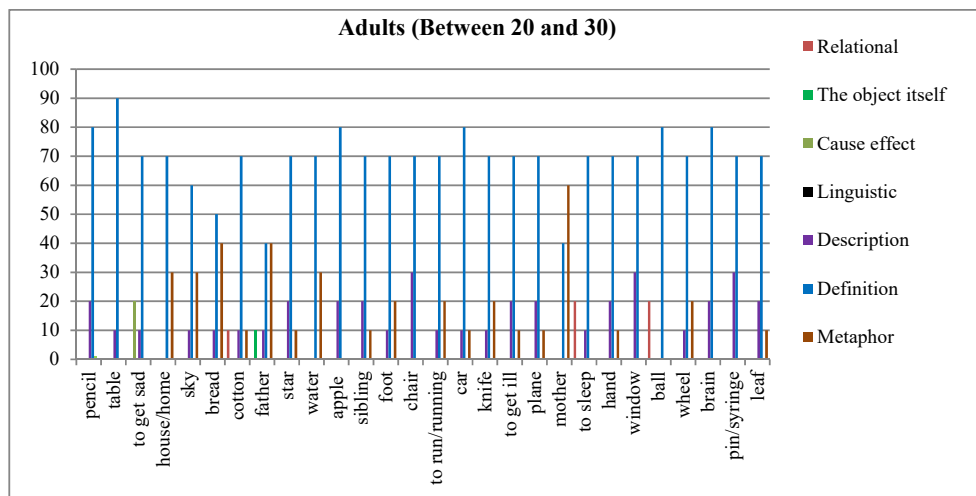


Fig. 5 Adults' reflection of concepts in language

#### IV. CONCLUSION

Under the guidance of the question how language and thought are related to one another, the analysis of the data showed that younger children, between 3 and 5, answered the question 'What is x?' mostly by referring to a related object, case, state or action. Second foregrounded conclusion related to this age group is that they stick to cause and effect relationship in the conceptualization of verbs. Based on the findings showing that young children stick to relational and cause-effect relationship implies that they rely more on their perceptual experience in the construction of the reality of the external world since both relations and the outcomes of actions are perceptible ones.

The developmental changes are not identified in the form of stages; instead there is a continuum in that the improvement is incremental with increasing age. Although we do not mention the differences between 4 and 5-year-olds, this does not mean that they are identical in all aspects. Within this continuum, it is observed that the age of 6 is the first turning point in the transition from relational approach to the tendency to describe and define the objects/concepts they are asked. Six-year-olds are also different from younger participants regarding the conception of causality. While the form of causality is in such a form as 'the VERB causes a RESULT' in younger children, it turns out to be 'the VERB is the RESULT of SOMETHING' in 6-year-olds' production.

The reflection of the space objects is another difference noted in the production of 6-year-olds. They construct a three dimensional positioning of the objects *clouds*, *the sun*, *stars* and *the moon* as it is shown in Fig. 3. This positioning implies that children rely on their perceptual experience in the conceptualization of the objects they can visually perceive but cannot manipulate or touch.

The tendency of description and definition observed in 6-

year-olds reaches almost adult level of description and definition in 7-year-olds. 7-year-olds are also observed to come up with distal approach to objects/concepts while younger ages take a proximal stance. It can be argued that this stance is the outcome of cognitive maturation and instructional language.

While 9-year-olds and older children reflect a distanced conceptualization of objects and concepts in general terms, it is observed that they still preserve the proximal conceptualization that is mostly observed in children between 3 and 7. The proximal approach to some objects such as water, bread, sky, chair etc. is characterized by the mentioning of a related action to describe or define the related object or concept. There is no age group which takes fully distal conceptualization towards the objects and concepts they were presented as stimuli.

The age of 10 yielded results showing that they reached adult level of descriptive and definitive approach in their answers to 'what' answers. Within the framework of this study, adults differ from 10-year-olds regarding the production of genuine metaphors while the usage of cliché metaphors emerges around the age of 4 or 5.

When all of these findings are taken into consideration, it can be argued that the relationship between language and thought is more complicated than we initially assumed it to be. However, our findings imply that younger children rely more on their perceptual experience along with linguistic input while children between 7 and 14 rely more on instructional language in the construction of concepts.

#### V. DISCUSSION

Although we assumed that the borders of each process of conceptualization, namely, perceptual, linguistic and instructional would yield clear cut borders, it is obvious in the

findings that all of these processes are interwoven; there are areas where all of them are at interplay and in other areas where one seems to be dominant but it is extremely difficult to identify an area where only one of them is the sole factor.

In the conceptualization of entities in relation to other ones, some of the entities had higher references to related entities than others. The reason for this high referencing must be the fact that this type of entities such as *table-chair*, *bread-to eat* are used often in pairs in daily life; e.g. it is common to call the family members to the dinner/lunch table by saying "Come on, we are eating bread!" to mean "Come on, we are having dinner/lunch." in Turkish, though this cannot be the mere factor.

Based on the fact that 3-year-olds relate the parts such as *wheel*, *window* and *leaf* to an action rather than the whole or another part of the whole, it can be argued to the extent the findings of this study can be generalized that action has a stronger impact on the conceptualization of the objects which are parts of a larger object than the structural form of the part per se.

The palpability of the entities such as *the sky* and *star* was reflected by 3-year-olds by containing detachment encoding utterances (colorful, up, air, evening, cloud or rain). None of these can be directly related with *I* or *my* as '\*I colorful/up/air' or 'My colorful, my air etc.' while the palpable nature of *plane* urges children to come up with proximal structures ((My) Going to Antalya, (My) Flying in the air). This outcome implies that palpability of the entity is a factor in the construction of distality and proximity in the defining features of concepts and this is reflected in the language by direct or indirect involvement of the speaker.

Subjective definitive approach to objects and concepts between the ages of 7 and 9 turns out to be scientific definition at the ages of 10 or eleven probably because children are instructed such kind of definition at school. It can be proposed that subjective definitive reflection in children's language is based more on cognitive development in that, knowledge is constructed through their perceptual experience in the way Piaget claims whereas scientific definitive approach is attained more through linguistic input in all avenues of education. This finding might imply that thought constructed through personal experience is dominant over language in the total construction of an individual at younger ages whereas language is more influential in the construction of thought at later ages.

As for the emergence of *definition* in children' language, we do not know whether each item which was defined by each participant has been defined by somebody to the participant. It seems more reliable to predict that once the participant is exposed to definitive language for anything, the participant develops the ability to apply this definitive approach to any object, action, event or state when she/he is asked a *what* question related to that thing.

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