

The Role of Conceptual Organization and Object Categorization among Young Children and Infants

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Abstract: The study investigates the role of conceptual organization in the classification of objects into basic levels, ordinate and superordinate categories.

The aim of the study is to examine the manner in which similar and diverse cognitive mechanisms are being applied especially, by young children and infants in their effort to recognize the variations that can be observed in object categorization.

The method used in carrying out the research involved content analysis and review of journal articles from diverse and interrelated disciplines across a vast range of research on conceptual organization.

The study shows that the similarities and differences found among young children as well as infant's cognition indicate aspiring views over the way objects are perceived and categorized. Object categorization across cultures is a cognitive process and are usually based on diversity in knowledge of the issues under investigation. Knowledge about one object can also lead to learning about other entities that might fall under the same or similar category.

The study concludes that language acquisition therefore, plays an important role in directing young children and infant's initial cognitive ability for object categorization.

Keywords: Conceptual Organization, Object Categorization, Young Children, Infants, Cognition

1. Introduction

The study of conceptual organization takes into account diverse and interrelated disciplines across a vast range of research. Conceptual categorization provides the basis for the classification of objects into basic levels, ordinate and superordinate categories. The similarities and differences found among young children as well as infant's cognition indicate aspiring views over the way objects are perceived and categorized. It will be worth investigating the manner, in which these similar and diverse cognitive mechanisms are being applied especially, by young children and infants in their effort to recognize the variations that can be observed in object categorization. The acquisition of knowledge and its useful utilization points to the human mind which is of paramount concern in examining the ability of individuals in object categorization at various hierarchical levels. Language therefore, plays an important role in directing young children and infant's initial cognitive ability for object categorization.

The paper begins on the premise that conceptual organization of objects occur in different forms depending on the given situation under research. Objects such as plants and animals can be generally categorized as parts of living things in scientific connotations whereas, objects such as church and mosque can be categorized as divine structural objects in religious connotations. The work will take into account the views of various research aspects within the fields of cognitive science, behavioural and developmental psychology, anthropology and linguistics. The paper aim at clarifying the problems associated with these various conceptual usages and how categorization of objects by young children and infants take place at diverse and similar levels.

According to Medin and Waxman (1998), Anthropologist Brent Berlin's research placed emphasis on cross-cultural similarities and differences in biological categorization with the thesis that certain privileged level exist within a hierarchical system in biological categorization. Berlin maintained that certain level of categorization appear more as "beacons" in biological terms (Berlin, 1992). Similar argument is also advanced by Atran (1990), with the view that children as well as infants can acquire knowledge through language which enable them to develop from the complex

to the simplest conceptual systems of cognition found in adults. Nersessian (1998) work on conceptual change argued that children are not blank slates on which teachers can imprint scientific knowledge, but have intuitive knowledge of conceptualizing physical objects from a wide range of domains that are different from science. They are assumed to usually follow a pattern of science learning from pre-childhood to maturation in cognition and instruction from teachers (Nersessian, 1998, p. 158). The authors maintained that proponents of cognitive psychology opined that the acquisition of concepts and taxonomies have their consequences in reasoning whereas, developmental psychologist focus their research by investigating on the development of early acquisition of conceptual linguistic aspects of organization (Medin & Waxman, 1998, p. 167).

The goal of Medin and Waxman (1998) research is to ascertain the nature of the correlation between culture, language and thought in conceptual development and modifications. A similar approach will be applied in this paper by examining the various conceptual interplay observed by the authors through cognition and language acquisition with a focus on the similarities and differences observed among young children and infants in object categorization. The work will try to substantiate the divergence in these concepts by focusing on a key area of research in cognitive psychology in terms of object categorization and expertise. The hypothetical question of whether the basic level of object categorization and expertise is a matter of fact or fallacy will be examined. A concept developed by Tanaka and Taylor (1991) with the notion that “individual differences in domain specific knowledge affect the extent that the basic level is central to object categorization” (p. 457)¹. The work shall review the theoretical background of conceptual organization by discussing the similarities and differences found with these conceptual systems and their significance to the cognitive discipline. The ideas presented by the authors on individual expertise in object categorization and modifications at the subordinate and the superordinate levels of object classification will be discussed. The empirical method used by the researchers in carrying out their experiment and its practical application within the cognitive discipline will also be examined.

2. Taxonomic Hierarchies, Folk Biological Classification and Reasoning

It could be worth noting that object categorization takes various forms considering the conceptual and organizational focus of the research agenda. In object categorization, objects are perceived to belong to certain or different kinds of hierarchies that are organized in terms of “basic levels”² treated by psychologists to be ‘privileged’ (Medin & Waxman, 1998, p. 168). These types of categorization are mostly common with the mostly preferred names that are attributed to objects. However, for the purpose of clarity, the interplay between entities across cultures constitutes natural clusters pointing to the fact that concepts correspond to these clusters. Medin and Waxman (1998), by citing Rosch, Mervis, Gray, Johnson, and Byes-Braem (1976) argued that “creatures that have feathers are likely to have beaks, wings, and two legs and can fly.” Further, creatures found without such features are said to be absent of these properties and as a result do not fit into the cluster (Rosch et al., 1976). The justification for such an empirical claim is that knowledge of entities formed an important aspect of the cluster to which entities belong. The mental pictures of such entities therefore, indicate that the closer the entity is to the prototype, the more similar it appears. Although one might find contrary views on similar topic, but the central theme found in the research is that categories reflect chunks or clusters of similar ideas and can be observed throughout in the world.

Medin and Waxman (1998) also observed another level in the work of Rosch et al. (1976) such as the “level of granularity” which they refer to as the “basic level” category which I also call as the family category level. It includes things such as chair, hammer, and dog which can be categorized in more general terms as furniture, tool and animal (p. 169). One interesting aspect found with the studies is the method of categorization which also supports the thesis that objects that are categorized normally possess the same attributes with similar objects found within the same category. According to the studies, basic categories stand out to be the most inclusive categories. The studies indicated that category (a) has a number of common features, (b) possess similar attributes that can be easily

¹Tanaka and Taylor (1991) work on “Object Categories and Expertise: Is the Basic Level in the Eye of the Beholder?”, University of Oregon maintained the view that experts and novices differ in their knowledge about subordinate category attributes and the difference should be reflected in their future lists.

²The basic level normally refers to the best name for something. It is the name that people prefer to use mostly in naming and possibly, the one that adult learners master at the initial stage of the learning process. Studies by (Rosch et al., 1976) also indicated that the measures used in referring to things at the basic level mark the same basicness as privileged.

identified with other members of the same category, and (c) it involves similar kind of movement when tested with similar class. These pioneering studies make great contribution to the cognitive discipline as it involves conceptual and organizational analysis of objects that explains the way individuals can be able to ascertain the names, similarities and differences found with objects through conceptual organization and cognition. One disagreement however, found with the studies that of anthropological and psychological measures of basicness. "Why do anthropological and psychological measures of basicness disagree?" The justification for disagreement as presented by the researchers is that of expertise since experiments are conducted in different ways and it involves a certain kind of individuals or objects. Individuals placed under experiment that are familiar with the issues proved to be more knowledgeable as compared to those that are unfamiliar with the test at hand. One example drawn from such an experiment is studies conducted on biological categorization. The ethno-biological studies show that people from modern technological settings are found to be less knowledgeable of the natural environment as compared to those found within the agricultural and traditional agrarian societies (Medin & Waxman, 1998, p. 169). Reasonable doubts could be raised over the method used by this studies given the fact that young children and adult learners are perceived to learn at different levels. The issue of whether individuals from one of the above settings are knowledgeable of the issues raised as compared to those placed under the other category can be difficult to ascertain without further studies. Studies within the cognitive discipline tend to be more engaging and it requires a mixed of different aspects of other fields with clearly defined and common measures of studies in order to be able to ascertain an outstanding result.

As mentioned earlier on in the paper, the goal of the Medin and Waxman (1998) research is to investigate the nature of similarities and differences found among cultures, language, and thought in the advancement and models of conceptual systems. In trying to reach an agreement in their research on the disagreement of anthropological and psychological measures of research, the researchers took into consideration two basic factors, one identified by Rosch et al. (1976) on expertise and knowledge of the issues under research, and the other by Berlin (1992) on the similarities and differences that exist in categorization. The researchers in their previous research by John Coley, Douglas Medin, and Elizabeth Lynch in collaboration with Scott Atran at the North-western University also involved the use of plants and animals and abstract properties that were projected to different taxonomic levels in order to prove the position already taken by both Berlin (1992) and Rosch et al. (1976) on expertise over basicness and similarities (Coley et al., 1997). However, responses to the question on whether (enzyme x) exist in woodpeckers were found to be consistent with the idea portrayed by Berlin on basicness and the folk-generic level in scientific taxonomy also corresponds closely with the genus that acted as privileged in induction. Therefore, any question raised beyond the knowledge and scope of the undergraduate students used in the research would have resulted into a sharp drop in responses according to the Rosch et al. (1976) thesis. For example, "Downy woodpeckers have enzyme x" would have also meant that all birds have "enzyme x" in comparison with the Berlin (1992) proposition. To be more provocative, the research fails to point out the learning process that takes place in object categorization. Since concepts lead to categorization, it is not only the objects that people categorized matters, but by categorization, individuals are able to learn about new entities which enforce their understanding and built up their cognitive ability in learning about new concepts³. Similar research on the local people of the Itzaj community in Guatemala by the authors presented slight differences on the level of expertise and knowledge of the natural world. The researchers assumed that people from agrarian society possessed more knowledge about the natural environment than those from modern technological settings (Medin and Waxman, 1998, p.171). It is important to note that knowledge from experience might be provided by the people of the Itzaj community, but students from modern technological settings can as well build expertise knowledge of the natural environment through learning processes.

3. Language Acquisition, Hierarchical Knowledge and Development

Studies within the cognitive discipline appears to be more aspiring when the issue of research relating to language acquisition comes into play. Language use by young children and infants takes into consideration different aspects as shown by Medin and Waxman (1998), with reference to Waxman et al. (1997). Placing infants under experiment in terms of object categorization through language shows variations in young children from different linguistic and cultural background. Cross cultural studies on languages such as English, French and Spanish form their root in the

³ Object categorization enforces the learning process and helps to build up the cognitive ability of people across geographical boundaries. It also contributes to the cognitive discipline by transforming new ideas into further concepts based on modification, cultural similarities and differences.

initial ability of children during their early months and years of development. The claim in developmental psychology that infants as well as young children are capable of labelling and categorizing objects at their mid-level of growth in terms of hierarchy as compared to other hierarchical levels becomes more interesting when different languages emerge to test children's language ability. The variations in categorizing nouns and adjectives as well as their linkages at hierarchical levels underscore the point that language influences conceptual organization. A notion that is also supported by Atran (1990), relating to the ability of young children and infant's acquiring language ability from the complex to the simplest conceptual systems of cognition similar to adults. Linguistic variations on object categorization present some diversity and similarities which indicate that the noun category can be assumed to be universal across languages with respect to the adjectives which appear to be more language specific in the case of Spanish speaking children. The thesis maintained that English, French and Spanish novel nouns possessed superordinate qualities and similar attributes in object categorization as compared to the use of adjectives across linguistic boundaries. Such a notion advanced by research underscore the point that language plays an important role in the development of young children and infants cognitive ability in object categorization.

4. The Basic Level of Object Categorization and Expertise

The empirical evidence shown by research within the cognitive discipline demonstrates critical aspects in understanding the way individuals across geographical boundaries form ideas on object categorization and hierarchical structures. There is however, a general consensus by various research on the manner in which objects are categorized based on their hierarchical structures and clusters though with interrelated concepts, but yet with similar agreement on the role of culture, language and the cognitive mental interplay of the subjects under investigation. In the work of Medin and Waxman (1998), it is portrayed that culture and language have greater influence on the cognitive ability of individual object categorization. The complexity of coming to such a conclusion nevertheless, considers other aspects and possibilities for further research in cognitive science. In addition to the empirical evidence presented by the authors, Tanaka and Taylor (1991) also presented similar views on the subject under investigation. The authors thesis are based on the notion that "individual differences in domain specific knowledge affect the extent that the basic level is central to object categorization" (Tanaka & Taylor, 1991, p. 457). This is as a result of further evidence shown by empirical research that the interaction between the human perceiver and objects point to a single level of abstraction for categorizing objects within the environment. The "basic level" as portrayed by Rose et al. (1976) discussed by Medin and Waxman therefore, holds an important segment of Tanaka and Taylor's empirical investigation in cognitive science.

The goal of Tanaka and Taylor's (1991) research is to investigate whether the unique psychological position ascribed to the "basic level" of object categorization can be modified by experience. The authors applied similar method used in the Rose et al. (1976) experiment by using subordinate category levels in place of the basic level category. The authors also used subordinate level names as basic level names and subordinate level categorization in relation to the basic level categorization. The authors also emerged at similar conclusion on the thesis that differences in individual knowledge of domain specific objects affects the basic level which is central to object categorization (Tanaka & Taylor, 1991, p. 458). The categorization of objects at the basic, subordinate and superordinate levels show an interesting phenomenon as individuals are able to easily categorize objects at the basic level as compared to the subordinate and superordinate levels. Objects such as (e.g. table, bird), are mostly names associated with the basic level as compared to (e.g. furniture, animal), used at the superordinate level and (e.g. coffee table, robin) that are associated with the subordinate levels of categorization. Interestingly, Rose et al. (1976), also observed similar traits in their subjects and the results show that individuals are able to initially identify objects at the basic level and later progress to either the superordinate or subordinate levels of categorization. In essence, this thesis takes us back to the same and earlier proposition made in this paper that objects as perceived by individuals are typically placed in correlated clusters and knowledge of such entities formed an important aspect of the cluster to which the entities belong (Medin and Waxman, 1998, p. 168)⁴.

Another experimental support of the Medin and Waxman (1998); Tanaka and Taylor (1991) hypothesis is that knowledge organization by parts "partonomy" and the organization of it kinds "taxonomy" provides information of the basic level that may emerge from the availability of influence from structural attributes that allows objects to

⁴Categorization of objects should conform to the attributions of prototype which are evident in entities that belong to the same cluster. Objects that exhibit such traits are said to have similar features as compared to those entities found within the same cluster.

function at the basic level (Tversky & Hemenway, 1984, p. 169-70). Therefore, having knowledge of object parts and their interrelationships in a taxonomic sense provides the tool for understanding which category or class it should be placed. In conformity with the Rose et al. (1976) thesis, the results of Tanaka and Taylor (1991), on expertise knowledge suggest that individual expertise is primarily determined at the subordinate level of abstraction as compared to the basic level. This implies that subjects at the novice domain were able to list as many features at the basic level as compared to experts listing at the subordinate and superordinate levels of object categorization.

5. Conclusion

In summary, the several research conducted and discussed in this paper subscribe to the view that language, culture and cognitive knowledge about concepts and categorization plays an important role in young children and infant's development. The interplay between cognitive similarities and differences in object categorization and language acquisition associated with cognitive science as well as other fields of research holds a promising ground in modifying individual way of thinking and forming concepts based on knowledge and understanding of our natural surroundings. Our mental picture of objects therefore, helps to form our basic concepts of that object. Universal agreement and coherence as proven by research on language, concepts and expertise knowledge of object categorization support the thesis that, people across cultures do share knowledge of certain things in common and that knowledge of objects which fall under similar category possess attributes that placed them into the same cluster. Medin and Waxman (1998), in conformity with the work of Tanaka and Taylor (1991), have made their points in underscoring the notion of basicness, privileged categorization based on similarities and differences, and knowledge of the issue under investigation such as expertise. For the cognitive discipline as well as other fields of study such as anthropology, psychology and linguistics, the issues observed relating to expertise knowledge, similarities and differences that exist in categorizing and naming objects can be of immense value, but still needs further investigation. The paper will argue that indeed, object categorization across cultures is a cognitive process and are usually based on diversity in knowledge of the issues under investigation. And knowledge about one object can also lead to learning about other entities that might fall under the same or similar category.

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