

Cognitive Theories of Concepts and Wittgenstein's Rule-Following: Concept Updating, Category Extension, and Referring

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ABSTRACT

In this article, the authors try to answer the following questions: How can an object/instance seen for the first time extend a category or update a concept? How is it possible to determine the reference of a concept that represents a behaviour? In the first case, the authors discuss the learning of inferential linguistic competence used to update a concept through an approach based on prototype theory. In the second case, the authors discuss the learning of referential linguistic competence used to determine the reference of a concept (i.e., determination of an actual behaviour) through an approach based on embodied cognition. The authors show how combining prototype-based and embodied categorization in Wittgenstein's rule-following praxis (the individual and community dimension), linguistic learning of a concept (inferential competence), and determination of its reference (referential competence) can be traced back to the same model.

KEYWORDS

Action, Categorization, Embodied Cognition, Embodiment, Linguistic Inferential Competence, Linguistic Referential Competence, Perception, Prototype Theory, Reference, Sign

INTRODUCTION

The article addresses the problems of extending a category and updating a lexical concept, and determining its reference. The authors try to answer the following questions: how can an object/instance seen for the first time extend a category or update a concept? How is it possible to determine the reference of a concept that represents a behaviour? That is, how is it possible to include a behaviour to a category? In the first case, the authors discuss the learning of inferential linguistic competence (Marconi, 1997) used to extend a concept through an approach based on prototype theory (Rosch, 1975). In the second case, the authors discuss the learning of referential linguistic competence (Marconi, 1997) used to determine the reference of a concept (i.e., determination of an actual behaviour) through an approach based on embodied cognition (Borghi, 2015; Barsalou, 2017). Finally, on the basis of the dual dimension of rule-following praxis (Wittgenstein, 1953), that is the community dimension and the individual dimension, the authors show how it is possible to combine the two approaches into a single model that deals with both the meaning and the reference of a concept.

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To clarify the issue, let us suppose that a person has read many books about a certain insect to the point where he can talk about it in detail, that is, to the point where he can make the most wide-ranging inferences about it, for example about its colour in the various seasons or environments, its reproductive system, its diet, but in fact, although he is “linguistically competent”, it is possible that he might not be able to recognize one if he saw it. How is it possible to associate the object with the concept in such cases? Or, in the case study, to associate the behaviour with the concept?

As mentioned above, the answer must be sought precisely in the dual praxis of rule-following, which allows some central aspects of the two cognitive theories to combine into a single model that accounts for, at least in certain cases, the ways in which words/signs are associated with concepts and concepts with behaviours.

The following section presents the notions of inferential and referential linguistic competence, the relevance of typical features and inferential competence in extending a category and updating a concept, and the ways of reference. The subsequent section outlines the notions of concept and category within cognitive science and the two main cognitive views on concepts, namely Representational Theory of the Mind and concepts as abilities. The following section presents the classical theory of concepts, which does not seem to be adequate for a cognitive treatment of categorization. Therefore, Prototype Theory and embodiment are considered in the following. One of the purposes is to show how these two theories, when combined, are able to account for the categorization in a more satisfactory way than classical theory, not only with respect to learning and classification, as is already known in the literature, but also with respect to updating a concept and determining reference. That is, the authors show how prototypical and embodied categorization drive the process of acquiring inferential and referential linguistic competence.

The next section presents the notion of rule-following, with a particular focus on both the community and the individual dimensions. The central idea is that these two dimensions of rule-following are compatible with some aspects of Prototype Theory and inferential competence, and with some aspects of the embodiment approach and referential competence. The subsequent section introduces the case study of the driving instructor and recalcitrant pupil in learning appropriate road behaviour after seeing a road sign for the first time. The following section deals with the analysis of the case. Finally, the authors take stock of the proposal.

LEXICAL COMPETENCE, ACQUISITION OF TYPICAL FEATURES AND REFERENCE

Here the authors introduce lexical competence, outline the role of typical features and present the modalities of reference determination.

Lexical competence means the ability of a speaker both to understand a concept conveyed by language and to refer to the object of which the concept is a representation. Using Marconi (1997) we could talk about inferential lexical competence when we understand a concept (e.g., the characteristics of the insect), and about referential competence when we are able to connect a concept with an object (e.g., the insect).

For Marconi (1997) there is a clear distinction between inferential and referential competence. Inferential competence contributes to the understanding of the meaning of words in relation to a certain use of language, for example in relation to a description or a certain connection between words (dictionary properties). But it does not account for the meaning of words in relation to their application to the objects in the world, in fact it is not sufficient in order to deal with their reference. Going into more detail for the purposes of the article, in Marconi’s cognitive view “lexical competence has two aspects: an inferential aspect, underlying performances such as semantically based inference and the command of synonymy, hyponymy and other semantic relations [*relevant to the construction of categories*]; and a referential aspect, which is in charge of performances such as naming (e.g., calling a horse ‘horse’) and application (e.g., answering the question: “Are there any spoons in the drawer?”)

[i.e., referring and classification].¹ (...) Being a theory of individual competence, Marconi's account does not deal directly with lexical meanings in a public language: communication depends both on the uniformity of cognitive interactions with the external world and on communal norms concerning the use of language, together with speakers' deferential attitude toward semantic authorities" (Gasparri & Marconi, 2016).

Therefore, to account for the communication and learning of lexical concepts, the notion of lexical competence must be integrated into a broader perspective that attempts to explain this individual competence in relation to the uniformity of cognitive interactions with the external world (e.g., with a road sign), to the norms governing the use of language in a given community (i.e., rule-following) and to the deferential attitude towards semantic authorities (e.g., instructor vs. pupil).

As for the updating of a concept, the authors refer to the theory of prototypes (Rosch, 1975), which as we will see characterizes the structure of a concept as a set of typical features. According to this approach it is possible to update a concept by acquiring new typical features that describe and further characterize the concept already known. Specifically, the authors will refer to the linguistic descriptions of an instructor and to the inferential competence of a pupil in relating new typical features of the concept GIVE PRECEDENCE² with those already known by the pupil.-

As far as the reference of a linguistic expression in general is concerned, three paths can be followed: the description theories approach; the direct reference approach; and a mixed approach. "1) the reference of an expression E is fixed by certain descriptions that competent speakers associate with E; E refers to whatever those descriptions, or a weighted most of them, uniquely describe. 2) (...) the reference of E to be explained not indirectly via associated description but rather by some direct relation between E and the world, presumably some sort of casual relation, historical, reliabilist, or teleological. 3) Finally, there is the possibility of theories that explain reference partly in terms of associated descriptions and partly in terms of the direct relation" (Devitt, 2015, pp.33-34). As we will see later, to account for the reference of a lexical concept, the authors consider an integrated approach based both on descriptions (i.e., the behaviour to be carried out following a road sign, as described by a driving instructor), and on the teleological dimension (i.e., the actual behaviour carried out by a pupil in order to avoid a collision) (on the relation meaning-goals, see Cruciani, 2018).

CONCEPTS AND CATEGORIZATION FROM A COGNITIVE VIEWPOINT

Concepts are the constituents of thoughts. Consequently, they are crucial to such psychological processes as categorization, inference, memory, learning, and decision-making. Categorization is considered an adaptive cognitive process by which people subdivide the world into categories (Gagliardi, 2014; Harnad, 2017). Categories are formed on the basis of criteria of which lexical concepts are expressions. For example, the concept of dog provides the characteristics that an item must exhibit in order to be considered a member of the category of dogs.

In categorization, concepts are also considered a kind of "mental glue" that links past experiences with current interactions with the world (Murphy, 2002), for example, they allow the recognition of new items with respect to categories already formed. Moreover, concepts can be seen as forms of partial and perspective knowledge with which we try to order and give meaning to the reality that surrounds us by organizing it into categories (Gagliardi, 2014).

Below, two of the main cognitive views on concepts are briefly covered: concepts as mental representations and as abilities. The mental representation view of concepts has long been the perspective of reference in cognitive science and is still maintained by various philosophers and cognitivists (Carruthers, 2000; Millikan, 2000; Fodor, 2003). The mental representations view "maintains that concepts are psychological entities, taking as its starting point the Representational Theory of the Mind (RTM). According to RTM, thinking occurs in an internal system of representation. Beliefs and desires and other propositional attitudes enter into mental processes as internal symbols" (Margolis & Laurence, 2007). RTM accounts for intentional mental states in terms of semantic

properties of associated mental representations. For example, the belief that “The penguin is a bird” is based on the match or compatibility of the bird definition/concept and the penguin definition/concept. That is, it is based on inferential linguistic competence in relating two mental entities: PENGUIN and BIRD.

The abilities view of concepts conceives concepts as cognitive abilities (Dummett, 1993; Bennett & Hacker, 2008; Kenny, 2010). For example, the concept of bird could be equivalent to the ability to discriminate whether a certain entity belongs to the category of birds or not. Unlike the RTM, in the abilities view the concepts are therefore not mental images nor word-like entities in a language of thought, but are related to something one is able to do. Hence, the classification is based on the ability to relate/include a certain entity in the world in a specific category, that is, it is based on the referential competence in relating an instance to a category.

To clarify, the determination of the reference properly said consists in having a concept and as a result identifying a referent; the classification consists in having a ‘referent’ and consequently identifying the category it belongs to. The two processes have different directions, but the nature of the relation is the same, that is to say that in both cases concepts are connected with objects in the world, and this can be considered inherent to referential competence. Instead, compatible with RTM, the ability to relate the concepts, for example, PENGUIN and BIRD to each other can be considered inherent to inferential competence. One of the aims of the article is to show how these two aspects are related in the categorization.

Undoubtedly, understanding categorization and the nature of concepts are among the most debated intellectual challenges of cognitive science (Gagliardi, 2009), which include different conceptions of concepts and numerous theories that are sometimes not compatible (Thagard, 2005).³ Here, the authors focus on classical concept theory, prototype and embodiment theory.

CLASSICAL THEORY OF CONCEPTS

In Classical Theory (CT) a lexical concept is defined by some features that are considered necessary and sufficient conditions for its definition and are expressed by means of logical predicates. For example, a square is defined as a flat geometric shape with four equal sides and four right angles, meaning that the characteristics which make a square a square are ‘having four sides’, ‘having equal sides’ and ‘having four right angles’.

In CT, a concept represents a category, and the necessary and sufficient conditions that define it codify the characteristics common to the members of the category. These characteristics are considered individually necessary and jointly sufficient to unequivocally define the category.

From this perspective, objects fall into categories in an absolutely clear and unambiguous way: an object either belongs to a category or it does not. In addition, any object that satisfies the conditions is as full a member of the category as any other object that satisfies them, belonging to a category does not imply gradation (e.g., a penguin belongs to “bird” as much as a blackbird does).

The defining characteristics of a lexical concept are composed of simpler concepts, which act as conditions. To clarify this point, let us briefly use Carnap’s notion (1952) about postulates of meaning. BACHELOR is composed of MAN and UNMARRIED, whereby an object falls under BACHELOR if it is a man and he is not married, that is ‘man’ *and* ‘unmarried’ are the necessary and sufficient conditions to determine whether an object is a bachelor (i.e., an object is a bachelor *if and only if* it is a ‘man’ *and* is ‘unmarried’).

In these terms the acquisition of new concepts is a process of composition that moves from the definitional constituents (e.g., from MAN and UNMARRIED we can acquire BACHELOR). The updating of a concept is a process that concerns the replacement of the definitional constituents (e.g., one of the definitional constituents of MARRIAGE is the condition of gender difference: ‘a union between a man and a woman’ can be replaced by: ‘a union between two people’. Classification is a process in which an object is included in a category on the basis of definitional constituent (e.g., a

penguin is classified as a bird because it exhibits characteristics that satisfy the logical predicates that define BIRD). Finally, the determination of the reference refers to whether the defining constituents of a concept allow an object to be identified. For example, when faced with three objects, a table, a penguin and a square, determining the reference of BIRD means being able to indicate which object is a bird.

In any case, not everyone agrees with this way of understanding conceptualization and the role of conditions, especially when it comes to accounting for categorization. Among the various reasons, both theoretical and experimental, that have pushed some researchers to move away from the classical perspective, there are: the problem of the *conjunctive category*; the problem of the *transitivity* of category membership; the problem of *graded membership* (Murphy, 2002; Harnad, 2017). The problem of graded membership was shown in Rosch's work introducing Prototype Theory, which the authors illustrate in the following.

PROTOTYPE THEORY

In Prototype Theory (PT), concepts are conceived as prototypes that represent the typical features of the objects of a category, rather than definitions based on necessary and sufficient conditions (Rosch, 1975; Rosch & Mervis, 1975). This allows PT to successfully address some of the problems encountered by classical theory in explaining categorization.

The origins of PT can be tracked in Wittgenstein's *Philosophical Investigations* within the conception of "family resemblances" (Wittgenstein, 1953, §.67), according to which objects falling under a term share some common features, just like family members share some somatic features. The paradigmatic example is the concept of game: some games share some structural features with other games, but differ in other aspects. For example, tennis can be played with two players just like chess can, but in tennis there is a ball while in chess there is not, in tennis there is a ball like there is in football but tennis has two or four players while football has twenty-two, in football there are two teams like there is in volleyball but in football there is physical contact while in volleyball there is none. In essence, it is not possible to find the necessary and sufficient conditions to determine the concept of game, which instead shows typical features distributed.

In psychology, Wittgenstein's intuition was developed experimentally by Rosch (Rosch, 1975; Rosch & Mervis, 1975; Rosch, 1978). From Rosch's works it emerges that a lexical concept does not have a definitional structure in which a concept is defined by features that are necessary and sufficient conditions, but has a "statistical" structure in which a concept is defined by the most frequent features exhibited by the members of a category.⁴ Hence, categorization is seen as a process of comparison between similarities, e.g., an entity is a dog if it exhibits the typical features such as having a tail and wagging it, having fur, barking, etc. However, an entity can be considered a dog even if it lacks some of the most typical features of the category, such as wagging. Instead, as mentioned above, in classical theory an object that does not satisfy the necessary and sufficient conditions of a concept is not included in any way into the category (graded membership problem).

According to PT, people tend to identify a category of objects and to reason about its members by referring to a specific object typical of the category, called prototype. The prototype becomes the representative member of a category and can be identified with a more or less abstract instance, which exhibits the most frequent features of the members of that category. In essence, the prototype is a statistical summary of the category (Murphy, 2002).⁵

In PT, categorization is a process of searching for the maximum similarity between the attributes of an object and those of a prototype that represents a category. The objects that are most similar, those closest to the prototype, are considered typical cases while the objects that are less similar to the prototype are less and less typical until they become atypical objects. As a result, objects have a degree of belonging to the category and are not all members in equal measure: given a certain category, some of its members are considered more representative instances than others (e.g., a crow

is considered a more representative instance of “bird” than a penguin). The most representative instances share certain features, which in general are neither necessary nor sufficient conditions (e.g., the ability to fly for birds).

From this perspective, the acquisition of new concepts is a process of composition that originates from the typical features, e.g., from ‘having feathers’ and ‘ability to fly’ we can acquire BIRD. The updating of a concept is done by assimilating a new feature among the typical features of the representative member, as we will see in the following sections, the feature ‘give precedence in the car to those who come from the left’ updates GIVE PRECEDENCE. Classification is a process in which an object is included in a category on the basis of the similarity of typical features, e.g., a crow is classified as a bird because it exhibits features that match the typical features of BIRD. Finally, the determination of the reference concerns whether the typical features of a concept make it possible to identify an object. For example, when confronted with three objects: a table, a crow and a square, determining the reference of BIRD means being able to indicate which object shares more typical features with BIRD.

How is the reference of a new concept actually determined or, better, how does one learn the ability to relate the concept to the referent? The theory of embodiment helps us to answer this question.

THEORY OF EMBODIMENT

An interesting perspective on cognitive and categorization processes is the *embodied cognition* (Clark, 1997; Gagliardi, 2016; Barsalou, 2017), according to which cognitive abilities also depend on the body and the environment with which the body interacts. Cognition is embodied when it is deeply dependent upon features of the physical body, that is, when parts of the body beyond the brain play a relevant role in cognitive processing (Wilson & Foglia, 2017). This perspective considers essential not only the fact that the mind is not independent of the body, but also that the body is necessarily situated in certain physical and social environments, which have a decisive influence on cognitive processes, including learning and categorization (Barsalou, 2017). This approach is mainly aimed at the interaction between the motor system, the perceptual system and the environment.⁶

As far as conceptualization processes are concerned, the embodied perspective considers that concepts are influenced by body and ‘grounded’ in perception, action and emotion systems (Gallese & Lakoff, 2005; Barsalou, 2012). Currently, “the view that concepts of objects and of actions are grounded in sensorimotor system and evoke simulations is supported by much evidence. Accounting for abstract concepts, however, represents a major challenge for the future of embodied and grounded cognition, one not easy to deal with” (Borghi, 2015, pp.189).

However, in order to understand the meaning of words, whether they are for concrete or abstract concepts or for actions, they must ultimately be grounded in their world referents (Harnad, 1990). In the case the authors analyse, GIVE PRECEDENCE is abstract in that it concerns an obligation and is grounded in an action and perception, that is the actual behaviour in situation. Prinz (2002) argues that it is precisely the referential activities that allow us to grasp the meaning of words. People use a tracking strategy to understand words, that is they anchor and link words to something nonverbal, typically their referents. According to Prinz, tracking strategy is used for both concrete and abstract categories, as the latter, like concrete categories, are correlated with features that are perceivable and work as signs to track the category.

In the following sections, we will see that the updating of GIVE PRECEDENCE, based on the acquisition of new typical features, is perfected on the basis of a supervised embodied action (triggered by perception of a sign) aimed at realizing an instance of the extended category, that is to determine the reference of the updated concept.

RULE-FOLLOWING

Rule-following is a central notion in Wittgenstein's *Philosophical Investigations* with regard to language, mind and action. Here, it is of interest regarding language and action, and is considered with reference to both the individual and the community dimensions.

Rule-following has at least two dimensions: one related to embodied praxis, that is, a dimension that concerns an 'internal' relationship between the rule and correct or incorrect application of rule, and the other is related to the public nature of the rules, that is, a dimension that concerns an 'external' relationship between the rule and correct or incorrect application of rule.

Before presenting the notion of rule-following from the perspective of this article it should be stressed that there is no agreement with respect to these two dimensions among philosophers. Some argue that the notion of rule-following presupposes a community in which there is agreement whether doing something in a certain way is rule-following, others argue that when Wittgenstein speaks of practice he does not mean a social practice nor does he presuppose a community, but he means that rule-following presupposes a regularity, a repeated and recurrent way of doing things, which could also be represented by a person who lives completely isolated (Malcom, 1989). In the first case, the criterion of the correctness of the rule-following depends on consensus in the community (e.g., of experts versus non-experts). In the second case, it depends on the fact that a certain practice has produced good results.⁷ Having said this due premise, let us see in more detail how Wittgenstein deals with this issue.

What does rule-following mean for Wittgenstein? Rule-following means behaving in a way that meets certain criteria. With regard to language (e.g., using words to refer to objects) rule-following means regularly applying certain words in certain ways. Wittgenstein sustains that in most cases, when we speak of the meaning of a word we mean its use (Wittgenstein, 1953). And the use of a word can vary depending on the language-game engaged in, and each language-game has its own rules, which a speaker must learn in order to become a competent speaker.

But what is a rule? A rule can be seen as the interpretation of a behaviour, or it can be seen as a typical behaviour in a paradigmatic case or rather a certain behaviour given certain circumstances, by means of which it is possible to compare similar behaviours in similar circumstances.

With regard to the conception that a rule is the interpretation of a behaviour, Wittgenstein says: "(...) there is an inclination to say: every action according to the rule is an interpretation. But we ought to restrict the term 'interpretation' to the substitution of one expression of the rule for another" (Wittgenstein, 1953, §.201). For example, the linguistic expression "give precedence to both the right and the left" is an interpretation of the rule expressed by the yellow road sign rhombus-shaped bordered in white with black diagonal.

With regard to the conception that a rule is its application, Wittgenstein says: "(...) there is a way of grasping a rule which is *not* an *interpretation*, but which is exhibited in what we call 'obeying the rule' and 'going against it' in actual cases" (Wittgenstein, 1953, §. 201). The behaviour of giving precedence to both left and right is the application of the rule expressed by the road sign and, under certain circumstances, the actual behaviour may or may not conform to the rule.

And how does one learn/establish the (correct) application of a rule?

"Let me ask this: what has the expression of a rule — say a sign-post — got to do with my actions? What sort of connexion is there here? — Well, perhaps this one: I have been trained to react to this sign in a particular way, and now I do so react (...) I have further indicated that a person goes by a sign-post only in so far as there exists a regular use of sign-posts, a custom" (Wittgenstein, 1953, §.198).

According to Wittgenstein, conforming to or contravening a rule means conforming to or contravening a paradigmatic behaviour that acts as a reference for the application of a rule under certain circumstances (relationship of correctness). That is, for Wittgenstein it is the paradigmatic-

application of a rule/word in a new circumstance that determines what rule-following/use a word correctly means in that circumstance. But how is it possible that the application of a rule become paradigmatic? It is possible because a certain application has a stable use (internal relationship of correctness) and is public (external relationship of correctness).

But how can a behaviour be learned as a paradigmatic application of a rule? One way is the training of the pupil by the instructor.

Then am I defining “order” and “rule” by means of “regularity”? — How do I explain the meaning of “regular”, “uniform”, “same” to anyone? — I shall explain these words to someone who, say, only speaks French by means of the corresponding French words. But if a person has not yet got the concepts, I shall teach him to use the words by means of example and by practice. — And when I do this I do not communicate less to him than I know myself. In the course of this teaching I shall shew him the same colours, the same lengths, the same shapes, I shall make him find them and produce them, and so on. I shall, for instance, get him to continue an ornamental pattern uniformly when told to do so. — And also to continue progressions. And so, for example, when given: to go on: I do it, he does it after me; and I influence him by expressions of agreement, rejection, expectation, encouragement. I let him go his way, or hold him back; and so on. (Wittgenstein, 1953, §.208).

In summary, correct rule-following is learned in a practical way by doing something, the way of doing is subject to criteria of correctness of application with respect to a paradigmatic application. The paradigmatic application of a rule is fixed by the experts of the community, e.g., the instructor for the pupil, the doctor for the patient, and, paraphrasing Marconi (1997), the convergence towards the paradigm occurs, at least in some cases, due to the deference of the non-expert towards the expert.

The following is a case showing that through “to follow a rule” in the above sense, it is possible to explain how a new concept is learned (GIVE PRECEDENCE TO THE LEFT AND RIGHT) or a concept already known (GIVE PRECEDENCE) is updated, and how it is possible to determine the reference, or rather the actual behaviour.

THE DRIVING INSTRUCTOR AND THE RECALCITRANT PUPIL

Let us consider the case in which a driving instructor indicates the road signs while driving on the road and reminds a pupil of the appropriate behaviour for the situation, in other words associates the sign with the behaviour to be carried out in a certain situation (e.g., “that’s a sign that indicates give precedence, but since there are no cars coming from either the left or the right, there is no requirement to stop”).⁸ Moreover, while driving, he influences the pupil’s behaviour both with verbal expressions (“Good”; “Slow down!”), and directly by operating the pedals to the right of the driver’s seat (e.g., the brake), in the event that the pupil does not behave in a manner appropriate to the situation.

During a driving lesson the student sees a sign that he does not remember ever seeing before (a yellow rhombus with white border and a black diagonal) and the instructor names the sign as “road without right of precedence”. Accordingly, the instructor describes the signal “road with right of precedence/without right of precedence”: the signal is shaped like a yellow rhombus with white border and a black diagonal or without black diagonal depending on whether the road is respectively without right of precedence or with right of precedence. In addition, the instructor describes some behaviours that should be followed in case a driver travels on one type of road or another type, for example slowing down and stopping at a crossroads if a car comes from either the left or right, or slowing down but without stopping if no car comes; instead in case the road has the right of precedence there is no need to stop at crossroads but it is sufficient eventually only slowing down without giving precedence to other cars. Now the pupil is able to make various inferences about the meaning of the sign, that is

about the behaviour required if the sign is encountered and there is a certain situation in the road (e.g., the presence of other cars coming from the left or the right, or when there are no other cars).

However, more generally, the pupil is able to speak competently on the concept GIVE PRECEDENCE, for example: precedence is given to the right; precedence is given to the left, even only by slowing down when a triangular sign edged in red pointing down is encountered; precedence is given to a car regardless of its direction when it is in situations at risk.

The pupil driving along the road with no right of precedence sees a crossroads with a smaller road coming in from the left with respect to his own direction of travel. Approaching the crossroads the pupil does not slow down and it appears that he is still not considering the cars coming from the road located to the left of the road on which he is traveling. The instructor intervenes with verbal warnings such as: do you remember that there was a sign in the shape of a yellow rhombus with a white border and a black diagonal? Do you remember what that sign means? What is the appropriate behaviour? The recalcitrant pupil seems to not slow down because it could be said he is *simply* applying the rule that “those who come from the right have precedence”, and – for illustrative purposes – this is reinforced by the fact that the road that enters from the left is smaller in size, without taking in the suggestions of the instructor. At this point, the instructor just before the crossroads actuates the brake pedal to the right of the driver’s seat to conform the pupil to the behaviour appropriate to the current situation: “there is a car coming from the left from on a road with right of precedence, so slow down and if needs be, stop”. The appropriate behaviour would have been different in different circumstances, for example if no other car had arrived from the smaller road, that is without a car coming from the smaller road, the pupil would have been able to pass through without changing his travel speed.

ANALYSIS

The pupil knows the prototypical concept GIVE PRECEDENCE, that is he is able to represent *some* elements that belong to the category “give precedence”. For example, he knows some typical features of the item (which here correspond to some behaviours prescribed by the concept, inferable from the concept) which represents the category “give precedence”: “give precedence to the right”; “give precedence to a car coming from the left near a triangular sign edged in red pointing down”; “giving precedence to a car when it is engaged in a risky situation”.

The pupil sees a sign he does not remember ever seeing before (yellow rhombus edged in white with a black diagonal).

The instructor names the sign: “road without right of precedence”.

The pupil has a prototypical concept of GIVE PRECEDENCE, that is, a representation from which he infers that he must give precedence to other cars given certain circumstances.

The instructor describes the behaviour to be followed.

The pupil does not slow down to give precedence to a car that comes from the left and is on a smaller road than that of the pupil (new circumstance).

The instructor reminds him verbally (community dimension of rule-following and external criterion of the correctness of its application). Here the criterion of correctness depends on the practice of glossing and deference to the instructor.

The recalcitrant pupil does not seem to conform his behaviour (moderate his speed and possibly stop) near the crossroads.

The instructor intervenes in the behaviour of the pupil, braking with the pedal to the right of the driver’s seat which is placed there specifically for the driving school (individual dimension of the rule-following and internal criterion of the correctness of its application). Here the criterion of correctness does not depend on language but on practice, embodied and supervised in our case, which has given good results.

In synthesis, reminded verbally and then ‘driven’ in embodied modality by the instructor by means of the pedals, the pupil carries out a paradigmatic behaviour and realizes an instance (in the sense mentioned above: a behaviour) of the concept GIVE PRECEDENCE, which he associates with the sign with ‘a yellow rhombus edged in white with a black diagonal’ and the expression “road without right of precedence”.

In this way, he updates the concept GIVE PRECEDENCE by assimilating another typical feature in addition to those already included, namely ‘give precedence to the left’. In addition, he extends the category by classifying the sign as “give precedence both to the right and to the left”.

The extension of the category implies a new behaviour to be carried out, that is the reference of the updated concept, which is determined in a practical way between descriptions and supervised embodied actions

In this way the pupil connects the concept and the reference.

CONCLUSION

The article has dealt with the issues of extending a category and updating a lexical concept, and determining its reference. The authors have attempted to answer the following questions: How can an object/instance seen for the first time extend a category or update a concept? How is it possible to determine the reference of a concept that represents a behaviour? That is, how is it possible to include a behaviour to a category?

With regards to the first question, we have seen that the sign in the shape of a yellow rhombus bordered with white, which has never been seen before by the pupil, is explained by the instructor to the pupil through the language. In this case we can speak of inferential competence of the instructor, that is the instructor describes the behaviour to be followed in cases where one meets the sign and certain circumstances on the road. At this point the pupil saw the sign (perception) and listened to the explanations about the meaning of the sign and the descriptions of the behaviour to be followed to the point where he could talk about it to other pupils (acquisition of inferential competence), that is he could explain what the rhombus shaped sign with the black diagonal prescribes: “give precedence both to the right and to the left” and describe how to behave when one meets the sign: slow down when the car is near a crossroads and give precedence to both to the right and to the left in the event of cars arriving, or proceed in the event of cars not arriving. Now the pupil knows the concept GIVE PRECEDENCE BOTH TO THE LEFT AND TO THE RIGHT and has associated the object/instance with the concept. In fact, the pupil has updated the concept GIVE PRECEDENCE, assimilating the feature ‘give precedence to the left’ to the typical features of GIVE PRECEDENCE, and then extended the criterion of belonging to the category “give precedence”.

With respect to the second and third questions, the answer lies at the embodiment level, that is to say in the situation in which the pupil recognizes the rhomboidal-shaped sign, that is, he is able to identify a relationship between the conceptual dimension and the perceptive dimension (because he has extended the category of items that fall under the concept GIVE PRECEDENCE), but is not able to behave in a certain way, given certain circumstances on the road, then the instructor “acts together with”, or rather partly intervenes in the driving of the car using the pedals on the right of the driver’s seat, in doing so, the instructor drives the pupil in the behaviour appropriate to the circumstances (embodied dimension). In fact, driven by the embodied behaviour of the instructor, the pupil realizes in practice the relationship between the concept GIVE PRECEDENCE BOTH TO THE LEFT AND TO THE RIGHT expressed by the sign with a yellow rhombus and black diagonal and the actual behaviour given certain circumstances, acquiring referential competence with respect to the updating of the concept and the extension of the category.

In summary, the authors have shown how some aspects of the *prototype-based* and *embodied* approaches can be integrated into the praxis of Wittgenstein’s rule-following. That is, they have shown that considering the two dimensions of the praxis of rule-following it is possible to model the extension

of a category and the updating of a concept on the basis of the acquisition of inferential competence with respect to the typical features of a new concept, and the determination of its reference on the basis of the acquisition of referential competence in embodied modality.

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ENDNOTES

- 1 Italics are of the authors.
- 2 Notation: concepts are written in capitals, e.g., DOG; categories in double quotes, e.g., “dog”; and typical features and conditions in single quotes, e.g., ‘furriness’.
- 3 See the theory of exemplars (Medin & Schaffer, 1978), theory-theory of concepts (Carey, 2009), conceptual atomism (Millikan, 2000), conceptual pluralism (Weiskopf, 2009), eliminativism (Machery, 2009).
- 4 Intuitively, defining features are such because they are more ‘cognitively relevant’ than others (cf. Sperber & Wilson, 1986/1995).
- 5 Prototypes can be seen as default conceptual representations (Prinz, 2002).
- 6 For a critique of embodied cognition, see Mahon (2015).
- 7 See Bloor’s interpretation (2005): “Wittgenstein said that when we follow a rule, ultimately, we act blindly (...) (§.219). There may indeed be intervening processes of interpretation, e.g., using subsidiary rules to follow the original rule, but in the end we just act (...) (§.201). Such routinized behaviour does not by itself necessarily amount to *correct* rule-following. (...) the normative aspect derives from the consensus between different rule-followers (pp.108-109).
- 8 The case is fictive.

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