UNIVERSITAT DE BARCELONA

On Word Definition in Children and Adults: Effects of Word Category and Level of Abstraction

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On Word Definition in Children and Adults: Effects of Word Category and Level of Abstraction

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ABSTRACT

This is a thesis about word definition. Early developmental studies of word definition, tested nous rather than other morphological categories (adjectives, verbs). As some authors have pointed out (McKeown, 1991) a proper definition includes a superordinate term that denominates the category to which the *word to be defined* belongs, followed by definitional features of the word. This description has been frequently translated into the formula 'X is a Y **that** Z' (Nippold, 1995; Watson, 1995) which has lead developmental researchers to consider that a definition that includes a relative clause to express the *differentiae* (key features of the *genus*) as a paradigmatic example of formal definition.

Developmental research present two limitations: the first one is that the effect of level of abstraction of the definiendum on the quality of word definition has been limited to nouns. The second one is that these developmental studies have been carried out, as a rule, in other languages than Spanish, mostly in English. The current thesis is aimed at overcoming these two limitations.

The general purpose of this thesis is to capture whether and how the syntactic and semantic features of verbal utterances produced by Spanish speakers for defining words vary as a function of morphological category and level of abstraction of the words. To address this general purpose, we undertake three studies. Study 1 portrays the initial state of definition as a metalinguistic activity in a group of 7-year-old children, an age considered as a milestone in the development of word definition. In study 2 we examine the same dimensions in the same task in a group of adults, and study 3 draws a comparison between children and adults' definitional abilities. Participants in both studies were asked to define 20 concrete and abstract nouns, 5 concrete and abstract

adjectives, and 7 concrete and abstract verbs. Word definitions were analysed for grammatical form and use of semantic components (i.e. categorical term, specificity of the hyperonym, and semantic content of the definiens).

Findings for Study 1 indicated a generalized effect of the morphological category of the definiendum on the syntactic and semantic dimensions of the definition. Level of abstraction only explained significantly the differences in the components of the semantic dimension. The results offered in this study revealed that the characteristics of the students are more important than the characteristics of the words to explain the differences in the performance in the syntactic complexity of the *definiens*' structure and in the categorical term of the *definiens*. However, the characteristics of the words were found to be more important to explain the differences in the specificity of the hyperonym and in the semantic content of the *definiens*.

Findings for Study 2 showed a generalized effect of the morphological category of the *definiendum* on the syntactic and the semantic dimension of the definition, except for the semantic content of the *definiens*. Level of abstraction only explained significantly the differences in the components of the semantic dimension. And the characteristics of the participants were found to be more relevant than the characteristics of the words in order to explain the differences in word definition performance of adults.

Findings for Study 3 revealed a generalized effect of age on the syntactic and semantic dimensions of word definition. Significant interactions were also found between age and morphological category for the syntactic dimension of the definition; and between age and morphological category, and age and level of abstraction of the definiendum for the semantic dimension of the definition. The differences observed between the definitional abilities of children and adults suggest (e.g., Snow, 1990) that the definition is a genre that needs time, practice and exposure in order to develop.

RESUMEN

Esta es una tesis sobre definición de palabras. Estudios de desarrollo iniciales de la definición de palabras investigaron la categoría morfológica *nombre*. Algunos autores han señalado que una definición que incluye una cláusula de relativo para expresar la *differentiae* (rasgos definitorios del *genus*) equivaldría al ejemplo paradigmático de definición formal. Los estudios sobre el desarrollo de la definición presentan dos limitaciones: la primera es que el estudio del efecto del nivel de abstracción del definiendum se ha limitado a los nombres; y la segunda es que estos estudios se han llevado a cabo, como norma general, en Inglés. Esta tesis pretende abordar estas dos limitaciones. El objetivo general de esta tesis es capturar si y como los componentes sintácticos y semánticos de las definiciones de palabras producidas por hablantes españoles varían en función de la categoría morfológica y del nivel de abstracción de las palabras. Para acometer este objetivo, llevamos a cabo tres estudios. El primero explora el estado inicial de la definición como actividad metalingüística en un grupo de niños de 7 años. El estudio 2 examina las mismas dimensiones en la misma tarea en un grupo de adultos; y el estudio 3 realiza una comparación entre las habilidades definicionales de los niños y los adultos. Los participantes definieron 20 nombres concretos y abstractos, 5 adjetivos concretos y abstractos, y 7 verbos concretos y abstractos. Las definiciones se analizaron de acuerdo a la estructura sintáctica y a los componentes semánticos que la forman.

Los resultados del estudio 1 y 2 indican un efecto de la categoría morfológica en las dimensiones sintácticas y semánticas de la definición. El nivel de abstracción explica las diferencias en los componentes semánticos de la definición. Además, encontramos que, en el caso de los niños, las características de los estudiantes son más importantes que las

de las palabras para explicar la diferencias en el desempeño en la complejidad sintáctica y en el término categorial; mientras que las características de las palabras resultan más importantes para explicar las diferencias en la especificidad del hiperónimo y en el contenido semántico. Sin embargo, las características de los participantes son más relevantes que las características de las palabras para explicar las diferencias en la definición de palabras de los adultos. Finalmente, las diferencias observadas entre las habilidades definicionales de los niños y de los adultos sugieren que la definición es un género que, como tal, requiere de tiempo, práctica y exposición para poder desarrollarse con éxito.

ACKNOWLEDGMENTS

This thesis was originally born with the purpose of studying the syntactic structure of definitions to assess the course of abnormal language development. However, through the early course of reading the literature on word definition and, particularly, the studies of word definition made in Spanish, we realized the need for developing a systematic and in depth study of word definition in Spanish, and, as a consequence, the original purpose became a more challenging and exciting one aiming at contributing to a better understanding of the syntactic and conceptual characteristics of word definitions in Spanish.

If the definition of a word is all about trying to capture the essence of a word's meaning, without a doubt the essence of the definition of this thesis is Dr. Liliana Tolchinsky. To her I will always be in debt. Without her this thesis would have never existed. I would be eternally grateful to her for her endless patience, dedication, for never giving up on me, for having shown me the path of light when I digressed (which happened countless times), for her encouragement, for her brilliant comments, corrections and ideas.

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1. INTRODUCTION

The beginning of wisdom is the definition of terms[1]

Socrates (469-399 BC)

1.1 On Word Definition

This is a thesis about word definition, a task that can be carried out in different contexts and for different purposes, but, what do we mean by defining a word? In the following lines we review several proposals that were made to characterize word definition with the purpose to illuminate the different facets involved in it and to advance our own characterization.

> 1) A definition can be seen as an attempt to capture the essence of a word's meaning by summarizing all of its applications and possible applications. There are compelling practical reasons for such attempts. A collection of summaries of word meanings offers valuable recourse to language users who reach the limits of their word knowledge (McKeown, 1991).

Proposal (1) focuses on the very aim of word definition: to seize the essence of a word's meaning. How can this aim be fulfilled? According to the author, a definition seizes the core meaning of a word by being a sort of précis of the actual and possible uses of the word. Even though the author does not explicitly state it in the above definition, when McKeown talks about 'summaries of word meanings' she is specifically referring to dictionary definitions. This proposal is centred around the *semantic content* of the definition, assuming that this semantic content corresponds to the core meaning of the

[1] Quoted in DeVries, 1991, and Nippold, 2016

defined word. McKeown also offers some motives that would justify to collect such attempts. The main motive is that a collection of definitions (summaries of words meanings) would provide language users, and by 'language users' the author specifically refers to young learners (4th grade to junior high school), with resources to overcome their limits of word knowledge. However, according to the author, the characteristics of the traditional format of dictionary definitions prevent young learners from making a useful learning tool out of them. Consequently, she proposes revising classical dictionary definitions so they can be applied to help students in learning situations. One of these revisions, in her view, requires to consider the 'essence' of the word and its unique role in the language as the starting point of a dictionary definition addressed to young learners. When McKeown refers to the "possible applications" she specifically refers to creating more functional dictionaries to make meaning easily accessible to young learners. In this sense, and according to the author, understanding the problems classical dictionary definitions present and the types of interpretations students make out of them would be a valuable tool for teachers to help students make sense of definitions, as well as a valuable resource for building dictionaries and glossaries for school textbooks.

2) What are we asking when we say: 'What is (a) X? First, we are asking for a verbal statement, that is, words in a certain ordered form. The minimal requirements of this outward form are that at least some of the words are not semantically empty and that the word on the left in the definition cannot appear on the right (Litowitz, 1977).

Proposal (2) focuses on the product of the task. According to this proposal defining a word consists in producing a verbal utterance, but not every verbal utterance serves as a definition. In the course of the reading of Litowitz's study, we discover that the requirements to be met by a verbal utterance in order to function as a definition of a word are the following: firstly, the *definiendum* (i.e. the term to be defined) must not appear in the *definiens* (i.e. the produced definition); and secondly, the definiens should aim at presenting the following form: 'an X is (a kind of) *class name* which *specific defining attribute or property* which exemplifies Y'. Even though the term *relative clause* does not explicitly appear in Litowitz study, the specifications she provides for the form the definiens should aim at presenting, evidence that the formal syntactic structure required by a definition, according to the author, includes a relative clause.
It is precisely the expression of these semantic aspects (i.e. class name and the specific defining attribute or property) of word definition through this specific ordered form what prevents the definition from being semantically empty.

To that end, the definer is required to include the definiendum under a 'class name', usually termed as *taxonomical category* (i.e. hyperonym) and to indicate a 'specific defining attribute or property', usually termed as *defining* or *definitional feature*, which allows to differentiate this member of the category from others (e.g., features that would allow to differentiate a *donkey* from a *horse*, both under the taxonomical category *animal*). The relations of the taxonomical category (or *categorical term*) and the definitional features constitute the exact form of an Aristotelian definition in terms of *genus* and *differentiae*.

So far we have learnt that the aim of defining a word is to capture the core meaning of the defined word and that the product is a verbal utterance that fulfils certain

formal characteristics. From proposal (3) we learn that word definition is a genre which requires practice in order to become fluent at it.

3) Giving definitions is a specific skill, i.e. a performance which requires practice to achieve fluency and consistency, that rests upon but also goes beyond knowledge of the genre and its characteristics or of the words used and their meanings (Snow, 1990).

In Snow's view, knowledge of the genre of definition includes: recognizing when a definition is requested, that is, recognizing that a question like 'What is a cat?' requires an answer in the form of a definition, rather than a description or a narrative; having adequate information about the meaning of the specific word for which a definition is required; and recognizing that it demands a conventional form. In Snow's characterization of the genre of definition both *semantic dimension* and *syntactic dimension* (i.e. form) of the verbal utterance produced for defining a word are considered. According to the author, knowledge of the characteristics of the definitional genre is not sufficient in order to apply consistently the meaning of the words into the formal structure required (e.g., '*a knife is something which you use to cut with*'). In order to organize semantic information into the "conventional" syntactic structure, children need opportunities to hear relevant models and to practice producing definitions. In Snow's view, school practice could help children retrieve and integrate hyperonyms into the structure of the definition. Furthermore, the practice may help children automatize the complex metalinguistic planning required for the syntactic

dimension of definitions, through the understanding and identification of the demands of the genre of definition.

4) La definición es una operación ligada al habla y al discurso, es la respuesta a la pregunta *¿Qué es X*? pregunta frecuente en diversos tipos de discurso, tanto hablados como escritos (Alberdi, García, & Ugarteburu, 2008).

   "The definition is an operation linked to language and discourse, it is the answer to the question 'What is X?', a frequent question in different types of discourse, whether spoken or written" (my translation).

Proposal (4) centres in the usage of definition. Word definition is seen as a commonly used discursive activity realized in the spoken and written modalities. When used in the spoken modality, the definition is considered as a natural activity that responds to the social need of making oneself understood. In the written modality, word definition, is assumed to have characteristics that are specific to academic discourse; in particular specific to expository texts. Word definition in expository texts would be a rhetorical method through which the writer selects and organizes the information with a specific purpose and for a specific reader. Among these specific purposes we could highlight some functions of the definition in scientific expository texts: as a structural unity that initiates the discourse; as a didactic tool; and as a textual resource of presenting semantic information of unknown (for the reader) linguistic units with the final purpose of the dissemination of knowledge. Depending on the type of information or semantic information the writer selects, definitions would present a different syntactic structures far from the 'prototypical definition structure' (i.e. X is a/an Y that Z). For example, if the writer wants to delimit the use of the concept, the definition would take a functional

structure (e.g., 'hyperonym+ that is used for'); however, if the writer wants to identify the purpose of the concept, the definition would take a teleological structure (e.g., 'hyperonym+ which is aimed at').

Through the analysis of the four proposals mentioned above we have learnt that definitions are verbal utterances that meet certain formal requirements –indicating that they have a *syntactic dimension*– and that are aimed at capturing the essence of the meaning of the defined word –the semantic content is assumed to summarize the core meaning of the defined word–. Now, we also know that the term to designate the word to be defined is the *definiendum*, and the term to designate the verbal utterance produced by a definer when asked a question of the type 'What is X?' is the *definiens*. Additionally, we have learnt that the definition is a category of text –a genre– and, as such, requires practice in order to be used consistently. Regarding the uses, we have learnt that definition serves as a natural activity for making oneself understood, but they can also fulfil different rhetorical functions, specifically in the written modality, and to fulfil those different rhetorical functions definitions may be realized in different syntactic constructions.

Thus the task of defining words is characterized by several dimensions, but the definitions we have selected above, like most of the definitions found in the literature, focus on one of its various dimensions, as do most of the studies we are going to review in sections 2 and 3. In the next lines we present our own account of the task of defining words in an attempt to embrace its many dimensions.

In the context of the current study, defining a word is a metalinguistic task, not a discursive one. Participants in the study are asked to answer 'What is X?', where X stands for different words. We ask from the participants to reflect on a certain word, not to use this word to fulfil a communicative purpose. We assume that we are asking to

'make explicit the implicit' (Watson, 1985) in the sense of requiring participants to access their implicit representation of the meaning of the word, to identify its taxonomical category (hyperonym) and the definitional features of the definiendum and produce a verbal utterance presenting the elements of the semantic dimension in a certain formal syntactic construction. The participants in the study are children that have not yet gained too much practice with the genre or received explicit instruction on the characteristics of a definition. We are going to compare primary schoolers untutored ways of defining words with the way literate adults undertake the same task, for the purpose to exploring the effect of age/schooling, and consequent exposure to written language, on definitional abilities.

Litowitz, clearly stated that the formal syntactic structure required by a definition includes a relative clause. According to proposal (4), however, we have seen that definitions might be realized in different syntactic constructions to fulfil different rhetorical functions. As we shall see, however, most of the studies have drawn their conclusions about what definitions are linguistically and psychologically based on one precise word category: nouns.

In the context of this study we examine the syntactic constructions in which word definition is realized as a function of morphological category –noun, verb or adjective- and level of abstraction of the word to be defined, the *definiendum.*

Definitions (2) and (3) deal with the formal structure of a definition, however, this formal syntactic structure seems to be readily applied to nouns, while, as we shall see later on, there is a lack of agreement among different studies regarding the structure of the definitions for other word categories (e.g., adjectives and verbs). Likewise, none of the previous proposals consider possible variations in the syntactic structure of the definiens as a function of the level of abstraction of the definiendum.

Thus, the current thesis is innovative in its attempt to examine the effect of morphological category and level of abstraction on the syntactic and semantic dimensions of word definition among primary schoolers and adults. Moreover, it is the first systematic study on this topic in Spanish. Certainly, there are a few studies on definition that have been carried out in Spanish but they are rather unsystematic and based on too small samples.

Given the different dimensions that characterize word definition, it is not surprising that the study of this multifaceted activity has been approached from different perspectives, from the earliest views in classical Greece, through lexicographic approaches, and linguistic-discursive approaches on specialized written discourse and up to the consideration of word definition as a metalinguistic task and the more recent developmental views. In the following sections we will elaborate on four perspectives through which the study of definition has been approached before advancing the developmental view on which the current study is based.

1.2 DIFFERENT APPROACHES ON WORD DEFINITION

1.2.1 As Part of a Reasoning Method

The first studies on definition originate from the classical Greece. In the *Topics* (books VI and VII) of Aristotle it is defined as follows:

> "La definición es un enunciado que indica el *qué es ser*[2] para el objeto […] y si se predican en el *qué es* los géneros y las diferencias, es manifiesto que [si uno toma aquello que es lo único en predicarse en el *qué es* del objeto] el enunciado que contenga esto será necesariamente una definición" (Candel, 1982, 1988)
>
> "Definition is a statement that indicates the *essential of the essence* for the object […] and if the genus and the differentia are predicated in the *essential of the essence*, the statement containing this would be necessarily a definition" (my translation)

Aristotle extensively elaborates on the *genus* (i.e. categorical term) and the *differentia* (i.e. definitional features) in the *Topics*, but we provide here the following extract to exemplify this matter:

> "El género quiere significar el *qué es*, y es la primera cosa que se da por supuesta en la definición de lo mencionado […] Así pues, dejar de lado el género de *una palabra* no dice el *qué es ser*, pues la esencia de cada cosa va unida al género […] Todo género se divide por diferencias salidas de la misma división, como, por ejemplo, el animal es dividido por lo pedestre, lo alado y lo acuático. También si dicha diferencia es verdad, pero al añadirse al género no da lugar a la especie, es evidente que, en tal caso, esa no sería una diferencia específica del género, pues toda diferencia específica, junto con el género,

[2] The Aristotelian expression *el qué es ser* (*Tò tí ên eînai*) has also been expressed as 'the essential of the essence' or 'quiddity'.

produce una especie" (Candel, 1982, 1988). However, no mention to the form of definitions appears in the work of Aristotle (Candel, 1982, 1988).

> "By *genus* is meant *the essential of the essence*, and it is the first thing that is assumed in the definition of a word […] Hence, neglecting the genus of a word does not express its *quiddity*, as the quiddity of a thing is attached to the genus […] Every genus is divided by differentia originated by the same division, as, for example, the animal is divided by pedestrian, winged, and aquatic. Also, even when such differentia is true, but when attached to the genus it does not result in the species, it is evident that, in such case, that would not be a genus specific differentia, as every specific differentia, together with the genus, results in a species" (my translation)

However, through the detailed course of reading of Aristotle's work, we come to realize that no mention is made to the syntactic form of definitions (Candel, 1982, 1988).

In the Aristotelian work, the definition is one of the four fundamental elements of the dialectic method, those being: *propio* 'property', *definición* 'definition', *género* 'genus' and *accidente* 'accident'. In this approach, word definition should be understood in a very specific context, that is, the context of discussions that took place in public debates celebrated in the Agora in the classical Athens. In these debates, two discussants, with an instructive or an entertaining aim, assumed the roles of maintainer and impugner of a previously established judgement or opinion. The debate originated with a problem expressed in the form of a question, for example, *¿Es o no verdad que la tierra es plana?* 'Is it true or not that the earth is flat?'; after that, the two discussants made use of the dialectic method, specifically of the definition, with the objective of refuting the thesis hold by the other discussant. Therefore, definition in this philosophical context would be an activity to explain, as clear as possible, the discussant's thoughts or

knowledge on the matter discussed (i.e. to think better, to discuss better). This knowledge that the discussant would expose through the debate is considered by Aristotle as the 'concept' (*lógos*), which is inextricably reason and language (Candel, 1982, 1988). For Aristotle, language is not a human artificial creation, but its linguistic structure is rather a natural reflection of the biological structures responsible for making morphologically and functionally different some beings from others, a process analogous to the way in which the linguistic structure of the definition of the word *dog* would be a reflection of the essence (or quiddity) responsible for defining the external morphology and characteristics of the dog.

According to the former consideration, the conceptual and the linguistic level are intertwined in Aristotle, thus, the definition, in the reasoning method approach, would be the activity to enable the debate discussants to reflect about concepts, explain them, go beyond the mere opinion, and establish a dialogue through which holding and demonstrate their thesis.

1.2.2 As a Lexicographic Activity

Word definition has been extensively studied in lexicography, which finds the basis of its traditional rules in the Aristotelian notions of genus (i.e. identifying the taxonomical category to which something belongs) and differentiae (i.e. how it differs from other members under the same taxonomical category) for defining a concept.

According to Bosque (1982) "if there is one aspect considered key in the studies of lexicography applied to the confection of monolingual dictionaries, that is, without a doubt, the theory of definition". Researchers in this area have taken as a theoretical assumption the idea that the definition is a semic equation. According to Rey-Debove (1969, 1971) "the definition is a semic equation, but only of approximate equivalence. The operation that must be followed to get to the semic equation consists on arbitrarily selecting an element from the discourse to define it. We associate this element to a concept and this concept is analysed thoroughly in simpler concepts, which are, in turn, named with other *signifiers*. According to this operation, the definition has two levels, a conceptual level and a linguistic level, which do not coincide, because the conceptual is not linguistic".

In this approach the task of defining a word is considered as a "semic equiation", involving two different levels, the conceptual and the linguistic level. The nature of definition involving two different levels and the different classifications of definitions undertaken in lexicographic studies have led to heterogeneous monolingual dictionaries articles and to different classifications. Professor Seco (1978) exhibits some of the problems generated by this heterogeneity and provides a classification to confront each of these problems. According to Seco, the first problem is that only words with lexical content (nouns, adjectives, verbs and adverbs) can be defined through "content

metalanguage", while function words cannot be defined, they can only be explained through "sign metalanguage". The second problem is related to the differentiation between the conceptual and the linguistic, leading to different types of definitions, namely dictionary and encyclopaedic definitions. Dictionary definitions are "*nominal definitions*", which aims at explaining the meaning of the word; whereas encyclopaedic definitions are the "*real definition*". They describe the nature or the essence of the signified concept. Nominal definitions refer to language and deal with the meaning of the word, while Real definitions refer to the extralinguistic world, and therefore, deal with defining the object, thus the double nature of definition in this approach.

According to Bosque (1982) definitions with content metalanguage ("proper definitions") can be: (1) hyperonimic, which would correspond to the classical Aristotelian definition expressed as *genus* plus *specific difference*; (2) synonymic, considered both as a highly lexicographic definition, for being the best fit to the "law of synonymy", but also as the less rigorous type of definition, derived from the fact that there is no such thing as absolute synonymy, and that a high degree of synonymy in a dictionary could create circularity; and (3) antonymic, a definition based on negative inclusion (e.g., "*no vivo*" 'not alive' for *muerto* 'dead'). This "law of synonymy" or "principle of substitutability" is a notion taken from Leibniz (18th century philosophy).

This principle, at the core of every lexicographer's work, establishes that a definition has to be formulated in such a way that the definiens can substitute the definiendum, without altering the meaning of the latter. The immediate consequence of this law is the identity of category between the definiens and the definiendum, that is, the application of this law demands that the definiens presents a form adequate to the syntactic function of the definiendum. Therefore, following the principle of substitutability, if the definiendum is a noun, the definiens should take the form of another noun (with or

without specifiers) or of another noun phrase. If the definiendum is an adjective, the definiens should take the form of another adjective (with or without specifiers) or of an adjective phrase or prepositional complement. And if the definiendum is a verb, the definiens should take the form of another verb in the infinitive form, which could be followed by complements.

1.2.3 As a Linguistic-Discursive Activity

In the lexicographic approach, the definition does not exceed the limits of a sentence, however, word definitions can exceed the limits of a sentence according to the function or the context in which they are included. For example, in the case of specialised written discourse, such as scientific expository texts, the definition operates in a broader framework, generally the paragraph. Researchers studying word definition in written specialized discourses consider definition as the linguistic-discursive ground upon which to build a technical scientific-expository text. The descriptive study of Alberdi, García & Ugarteburu (2008) explains the relationship between the definition and the discourse, particularly the relationship between the linguistic and discursive resources to build definitions in scientific expository texts of different areas, namely arts, architecture, and medicine. According to Alberdi et al., (2008) word definition would be a segment or a sequence inside of the expository discourse, expressed inside the text through determined structures or linguistic patterns, or better yet, a rhetorical function or discursive procedure that works at the paragraph level. In this sense, and unlike in the lexicographic tradition, the definition transcends the limits of the sentence, and therefore, definition in scientific expository texts is usually used as a structural unit that initiates the discourse. Furthermore, Alberdi et al., (2008) state the tight relationship between definition and the process of knowledge transmission in the scientific language of a specific area. In this sense (Lorente, 2001) states that "the definition is a textual resource of representation of the semantic information of linguistic units that contains specialized meaning, even though it is not the only one, it may be the most natural one in a knowledge transmission situation. It is also a cognitive and discursive operation

linked to specialized languages, through which the access to knowledge, the stabilization and the dissemination of knowledge is aimed.

Regarding the relationship between the linguistic and discursive resources to build definitions in scientific expository texts, probably, the most common pattern taken by definitions in scientific expository texts is the one expressed by *X is Y*, where X is the definiendum and Y the definiens, which according to Alberdi et al. is nothing but the translation of the lexicographic paradigm to the discourse. Notwithstanding, expository texts of the type exhibit a broader range of resources and strategies to build a definition and in turn, the application of these different types of resources leads to different types of definitions inside the context of expository-explicative texts. In this sense, depending on the choices of concepts to be defined and the information the writer aims to transmit, the linguistic form of the definitions would vary. For example, if the writer aims at delimiting the use or function of the concept, the definiens would take a functional structure (e.g., hyperonym + that is used for); if, on the contrary the writer aims at delimiting the objective of the concept, the definiens, then, would take the form of a 'hyperonym + which aim/objective is'. As the main purpose of this type of scientific texts is the dissemination of knowledge, very often the writer chooses types of definitions which directly involve the reader. For example, the author could use linguistic resources or patterns that would make the reader know he is before a definition, such as: formulating the question *What is X?* which requires a definition for an answer; using clarifying linguistic expressions (e.g., X is defined as Y); or using metalinguistic expressions that clearly identify the definition (e.g., by X is understood Y).

1.2.4 As a Metalinguistic Activity

Word definition, in this approach, is considered as a metalinguistic activity in nature, as it represents the outcome of a reflection upon the properties and uses of language (Watson, 1985). This implies a reflection upon the fact that the word asked to be defined (i.e. definiendum) is a "phonological unit" with a semantic dimension (meaning) that needs to be expressed through a "specific" formal linguistic structure that would allow to link the semantic dimension of the definiens (i.e. categorical term and definitional features) with the definiendum. As a consequence, in this approach, the conceptual and the linguistic level coincide, as the speaker is trying to 'make explicit the implicit' (Watson, 1985). In this sense, the definition would be the activity through which a speaker would try to express the essence of a concept. In approaching word definition as a metalinguistic activity this proposal takes the point of view of the subject that performs the task as it attempts to characterize the dimensions of the task and the level of awareness the definer needs in order to perform the task successfully.

To summarize, the preceding approaches deal with divergent views regarding the purpose, context of use, and the framework of operation of the definition. In classical Greece, definition was used in the context of public debates as an activity to allow discussants to reflect about concepts, explain them clearly to the attendees of the debate, and to ultimately demonstrate their thesis. In the context of dictionaries, definitions are regarded as a means to help language learners in their learning process. And in the context of specialized written discourse definitions are used as structural units that allow the writer to organize the discourse. Regarding the linguistic framework in which definition operates, while lexicographic definitions do not transcend the limits of the sentence; expository texts definitions usually operate at the level of the paragraph,

and in classical Greece, the definition operates at a much broader framework, that is, the discourse in its spoken modality in the genre of the debate.

The previous approaches also diverge on the reasons that would cause a variation in the form of a definition. While for Aristotle such variation is not contemplated (as *form* of definitions is not an aspect included in his work), discursive approaches point to the information the writer wants to transmit as the trigger to *form variation* in definition. On the other hand, for the law of synonymy-abiding lexicographers, the form of definitions would change depending on the word category of the definiendum (word to be defined).

Despite their differences, all three approaches have two things in common. The first one is the implicit view of the definition as a means to instruct, transmit and disseminate knowledge. And the second one is that they all relate to word definition as an adult-like stable state of knowledge. Nevertheless, in Snow's characterization of the task (section 1) she clearly indicates that word definition is a genre that requires practice, and in her conception of the definition as a genre the context of this practice is specifically the one carried out throughout schooling.

A relevant question in this context is what shape would take the verbal utterances produced by young children in the early stages of schooling when they are asked to define words? Moreover, what differences are we going to find between the verbal utterances produced by children and those produced by adults when defining the same words? In addressing specific changes that are produced as a function of age/schooling[3] in a certain skill, in this case the definitional skill, we are taking a developmental approach to word definition.

[3] These two aspects, age and schooling, are indissolubly linked in our community (e.g., Tolchinsky, 2004; Nippold, 2004; Berman, 2004).

1.2.5 A Developmental Approach on Word Definition

Developmental approaches focus on the manner in which word definition develops in children, adolescents and adults (Nippold 2016). Typically, in developmental studies the participant is asked to explicitly explain the meaning of words presented in isolation, out of contexts of use. That is, studies gauge participants' metalinguistic knowledge of word meaning. This paradigm has served to assess children's semantic and conceptual development (e.g., Anglin, 1977; Inhelder & Piaget, 1964; Nelson, 1978; Norlin, 1981), development of the vocabulary and the intellectual functioning (e.g., Binet & Simon, 1915; Feifel & Lorge, 1950; Wechsler, 1974, 1991; Anglin, 1993), and reading ability (e.g., Roswell & Chall, 1992). Furthermore, the ability to define words has been shown to highly correlate with school achievement (e.g., Snow, 1992; Snow, Cancini, González, & Shriberg, 1989).

In the early studies on the development of word definition, nous rather than other morphological categories (adjectives, verbs) are tested. And in most cases the so-called Aristotelian definition (McKeown, 1991, p. 803) is the yardstick against which the development of definition is measured. McKeown indicates that according to Aristotle a proper definition includes a superordinate term that denominates the category to which the word to be defined belong followed by definitional features of the word. This description was frequently translated into the formula 'X is a Y **that** Z' exemplified by the sentence '*A knife* (X) *is an artifact* (Y) *that cuts*' (Nippold, 1995; Watson, 1995). The translation of the Aristotelian description into an English sentence lead developmental researchers to consider that definition of words that include a relative clause to express the *differentiae*, the key features of the *genus*, as a paradigmatic example of formal definition.

Formal definitions are "highly desirable in literate contexts" because they are clear, precise and include the essential features of the defined word (Nippold, 2016; Watson, 1995). Developmental studies have shown that the attainment of the semantic and syntactic features of the Aristotelian model of definition by children is gradual and slow. Before age 7 children tend to define common nouns appealing to personal experiences that lack superordinate terms. For example, for defining bicycle that say *You can use it to ride to Bruce's.* Most studies coincide in that age 7 constitutes a sort of milestone in the development of word definition because by that age the percentage of spontaneous use of superordinate terms increases and children's definitions evolve from the early functional and concrete definitions to more abstract and conceptual definitions that include a superordinate term (e.g., Al-Issa, 1969; Anglin, 1977; Fiefel & Lorge, 1950; Storck & Looft, 1973; Swartz & Hall, 1972; Werner & Kaplan, 1963).

More recent developmental studies explore semantic and syntactic features of definition when words of other morphological categories are tested, in particular verbs and adjectives. They have found that nouns seem to readily activate a superordinate term compared to adjectives and verbs. Furthermore, according to Johnson & Anglin (1995) children seem to achieve early matery of definitional form for nouns, compared to adjectives and verbs, and adjectives and verbs pose an added difficulty regarding the specification of semantic components in the definition.

Studies have shown that not only the morphological category of the word may affect the content and formal features of word definition also the level of abstraction has been found to affect the quality of definition. Concrete nouns –that refer to tangible "things" were found to be easier to define than abstract nouns, which lack tangible referents. Level of abstraction was found to affect, in particular, the use of the superordinate term even among young adults (Mc Ghee-Bidlack, 1991). Sadoski, Kealy, Goetz & Paivio

(1997) suggested that concrete instances of language are "more imageable, comprehensible, memorable, and interesting than abstract language units" (p. 518) making them more easily to define. Definitions of concrete nouns contained a greater number of superordinate terms and definitional features than those for abstract nouns. In a subsequent study Nippold, Hegel, Sohlberg, & Schwarz (1999) asked students aged 12, 15, 18 and 23 yeas to define low frequency abstract nouns (e.g., burden, humility) that were presented in a random order. Responses were scored in terms of use of superordinate term and number of definitional features. Results of the study showed that, although the responses improved with age, even in the oldest group, only 58% of the responses were awarded full credit. The researchers conclude that the ability to define abstract nouns is a protracted development, well into early adulthood.

Two remarks are relevant at this point. Firstly, research on the effect of level of abstraction of the definiendum on the quality of word definition was limited to nouns, it did not assess the effect of level of abstraction on other categories of words. Secondly, developmental studies, the ones that we quoted in this section and other to be quoted in section 2 were carried as a rule in other languages than Spanish, mostly in English. The current thesis is aimed at overcoming these two limitations.

The general purpose of this thesis is to capture whether and how the syntactic and semantic features of verbal utterances produced by Spanish speakers for defining words vary as a function of morphological category and level of abstraction of the words they are asked to define. To address this general purpose, we undertake three studies. Study 1 portrays the initial state of definition as a metalinguistic activity in a group of 7-year-old children, an age considered as a milestone in the development of word definition. In study 2 we examine the same dimensions in the same task in a group of adults and study 3 draws a comparison between children and adults' definitional abilities.

In the following lines we present the main general questions and hypothesis of the thesis and thereafter each of the three studies

1.3 GENERAL OBJECTIVES AND RESEARCH QUESTIONS

Previous studies in several languages have shown that age 7 represents a milestone in the development of word definition and only a scarce number of studies have attempted to characterize the verbal utterances native speakers of Spanish produce when asked to define words, but none of these Spanish studies included adult participants in their samples. Thus, the current thesis examines word definition in two groups of participants, primary schoolers and adults.

1.3.1 The first general goal of this investigation is to provide a systematic characterization of the syntactic and semantic dimensions of the verbal utterances children produce in response to the question '*What is X?*'.

1.3.2 The second general goal is to provide a similar characterization of the verbal utterances produced by the group of adults in response to the same question.

The task we are using is a strictly metalinguistic task, consequently, we assume that the utterance we are going to get reflects the participants' reflection on the meaning of the word they are asked to define, and we are going to analyse how this reflection is expressed.

Both lexicographic and developmental studies have shown that the morphological category of words affects the formal expression of definition.. Therefore, we assume that a systematic characterization of the syntactic and semantic dimension of definitions must take into account the morphological category of the definiendum. As a consequence, the participants in the studies are asked to define nouns, adjectives and verbs. That is, words in the three major morphological categories of Spanish language.

The specific questions concerning morphological category of words are: (a) what differences are we going to find in participants' definitions of nouns, verbs and

adjectives? (b) what differences can be identified in the syntactic dimension and which in the semantic dimension? (c) how do the two dimensions of word definition relate to each other?

Previous studies have shown that definition tasks can be challenging, even to adults, particularly when abstract words are presented. We therefore assume that, besides taking into account the morphological category of words, a systematic characterization of the syntactic and semantic dimensions of word definition must relate to the level of abstraction of words.

The specific questions in this respect are: (a) what differences are we going to find in participants' definitions of words that differ in level of abstraction? (b) what differences can be identified in the syntactic dimension and which in the semantic dimension? (c) how do the two dimensions of word definition relate to each other.

1.3.3 The third general goal of this investigation is to determine the effect of morphological category and level of abstraction of the words to be defined on the syntactic and semantic dimensions of the verbal utterances young children produce for defining words.

1.3.4 The fourth general goal of this investigation is to determine the effect of morphological category and level of abstraction of the words to be defined on the syntactic and semantic dimensions of the verbal utterances adults produce for defining words.

1.3.5 A fifth general goal of the investigation is to identify the main differences between the verbal utterances produced by children and adults for defining words of differing morphological category and level of abstraction.

Study 1 was designed to accomplish the first (1.3.1) and third objectives (1.3.3), study 2 to accomplish the second (1.3.2) and fourth objectives (1.3.4), and study 3 to accomplish the fifth objective (1.3.5).

1.4 MAIN HYPOTHESIS

Based on prior research (Markowitz & Franz, 1988; Johnson & Anglin, 1995) we expect that the syntactic structure of the verbal utterances children produce for nouns, verbs and adjectives will differ.

Similarly, based on prior research on the semantic dimension of word definitions (Skwarchuk & Anglin, 1997) we predict that noun definitions would contain more hyperonyms and of better quality than adjective and verb definitions.

As regards the level of abstraction of the definiendum, we predict that words with a higher level of abstraction would contain less hyperonyms, of less quality and less differential features than words with a low level of abstraction. However due to the lack of previous studies on the effect of level of abstraction, we do not have specific predictions for a possible effect of the level of abstraction on the syntactic structure of children's definitions of noun, adjectives and verbs.

As for adults, taking into account previous research (Benelli, Belacchi, Gini & Lucangeli, 2006; Markowitz and Franz, 1988; Marinellie and Johnson, 2003) we expect the syntactic structure of the verbal utterances adults produce for nouns and verbs to differ from the ones produced for adjectives.

Similarly, based on prior research on the semantic dimension of word definitions (Marinellie and Johnson**,** 2003) we predict that noun definitions would contain more superordinate terms and more definitional features than definitions of adjectives and verbs.

As regards the level of abstraction of the definiendum, and taking into account previous studies (McGhee-Bidlack, 1991; Nippold, Hegel, Sohlberg, & Schwarz, 1999), we

predict that words with a higher level of abstraction would contain less hyperonyms, of less quality and less differential features than words with a low level of abstraction.

2. STUDY 1: CHILDREN'S DEFINITIONS

2.1 Introduction

The study of the development of definition has a long tradition in developmental psychology in the exploration of children's semantic and conceptual development (e.g., Anglin, 1977; Inhelder & Piaget, 1964; Nelson, 1978; Norlin, 1981), development of the vocabulary and the intellectual functioning (e.g., Binet & Simon, 1915; Feifel & Lorge, 1950; Wechsler, 1974, 1991; Anglin, 1993), and reading ability (e.g., Roswell & Chall, 1992). Furthermore, the ability to define words has been shown to highly correlate with school achievement (e.g., Snow, 1992; Snow, Cancini, González, & Shriberg, 1989). Since then, many other studies have been conducted to explore the production of children's word definitions per se, regarding syntactic dimension (form) and semantic dimension (content) (e.g., Wolman & Barker, 1965; Al-Issa, 1969; Swartz & Hall, 1972; Wilson, 1975; Litowitz; 1977; Nelson, 1978; Wehren, de Lisi, & Arnold, 1981; Watson, 1985; Benelli, Arcuri, & Marchesini, 1988; Snow, 1990; Johnson & Anglin, 1995; Skwarchuk & Anglin, 1997; Nippold, Hegel, Sohlberg, & Schwarz; 1999). In the following lines we review the developmental studies that were carried out on word definition to explore its form and content and the development of these two dimensions in different word categories and in words with different levels of abstraction. Given that our focus is on production and not on comprehension of definitions, no further contributions on understanding definitions, apart from the ones made in section 1 (e.g., McKeown, 1991) would be mentioned.

2.1.1 Developmental Studies on the Syntactic Dimension

To the best of our knowledge there is only one study that has exclusively explored the form of word definition. The developmental study conducted by Friedmann, Aram, & Novogrodsky (2011) explored the syntactic structure of Hebrew-speaking children's noun definitions as a way to access the syntactic ability of children through various stages of language acquisition. Children (ages 3;5-8; n=121) were first tested in kindergarten and then retested 2.5 years later at the end of second grade. They were asked to provide definitions for 14 nouns (e.g., alphabet, bicycle, umbrella, clock). Children responses were analysed for the use of a relative clause, grammaticality of the relative clause depending on the presence of head, type of relative clause. Results showed that Hebrew-speaking children start using relative clauses in their definitions before the age of 4, and the use of grammatical relative clauses (i.e., presence of head and complementizer) increased with age up to age 6, when it seems to stabilize, as children who were retested at the end of second grade showed to differ in their use of relative clauses in their definitions. At age 6, children produced all three types of relative clauses, that is, subject, object and indirect object relative clauses in their definitions. The results from the study of Friedmann et al., (2011) seem to confront those obtained by Johnson and Anglin (1995). As we will discuss in the following section, these researchers found that 6-year-old children exhibited greater difficulties managing the syntactic structure of definition than in providing semantic content.

2.1.2 Developmental Studies on the Semantic Dimension

From the different studies on the development of word definition in children, two ubiquitous findings emerge. The first finding (Al-Issa, 1969; Anglin, 1977; Krauss, 1952; Litowitz, 1977; Nelson, 1978; Norlin, 1981; Feifel & Lorge, 1950; Wolman & Barker, 1965; Wehren, de Lisi, & Arnold, 1981) is that young children's early definitions (preschool up to 5 years old) tend to be: (1) functional, for example, in response to the question 'What is a cat?' a young children would say 'you pet a cat'; (2) contextual, that is, definitions in which children provide description of 'scenarios' or contexts in which the *definiendum* could participate (e.g., 'we have a cat named fluffy and you know what, fluffy had babies'; and (3) descriptive, that is, young children also provide perceptual features or characteristic features (e.g., 'oranges are round').

The second finding is that with age, superordinate categories –which are absent from these early definitions– begin to emerge in children's definitions, which, in turn, become more complete and elaborated. The emergence and rise of superordinate categories (i.e. hyperonyms) is the most robust finding in the studies of the development of word definition (e.g., Al-Issa, 1969; Anglin, 1977; MacNamara, 1982; Nelson, 1978; Norlin, 1981; Watson, 1985; Benelli, Arcuri, & Marchesini, 1988; Litowitz, 1977; Nippold, Hegel, Sohlberg & Schwarz, 1999). Paradoxically, a close examination of 5-year-olds definitions shows that young children express less than what they know of concepts in their definiens. Different studies have showed that, in fact, children have a vast knowledge of superordinate terms (e.g., Anglin, 1977; Watson, 1985; Markman & Hutchinson, 1984; Carey, 1985; Waxman & Gelman, 1986; Gelman & Baillargeon, 1983), however, superordinate categories are rarely included in their definitions (e.g., Al-Issa, 1969; Snow, 1990; Watson, 1985, 1995; Skwarchuk & Anglin, 1997). Different theories have been put forward in order to explain the gap between what children know

about superordinate terms and their spontaneous use of them in their *definiens* when they are asked to define a word:

1. ***Logical skills***. The most representative author of this approach is Piaget. According to Piaget (1945) and Inhelder & Piaget (1964), from 7 to 11 years old, children's reasoning becomes focused and logical. One of the most important developments at this stage is the concept of 'reversibility' (i.e., awareness that actions can be reversed). This logical principle allows children to 'reverse' the order of concepts into hierarchically different organizations at the same time, that is, a child might be able to recognize that his cat is a Siamese, that a Siamese is a cat, and that a cat is an animal (i.e. the knowledge that one can use two words for one referent). In the Piagetian view, language is considered as a factor that contributes to the development of thinking, but not as the cause of it. Therefore, if a child understands, for example, that every Labrador is a dog but not every dog is a Labrador, this means that he has successfully formed the '*category inclusion rule*' (matter of cognitive/logical maturation), and that, in turn, helps him to produce definitions linguistically appropriate. However, the study of Benelli et al., (1988) poses an objection to the logical principle of class inclusion proposed by Piaget. In their study, Benelli et al., analysed the role played by class inclusion capacity in children's production of oral definitions. The authors argue that if the capacity to produce superordinate terms in a standard definition derives from underlying logical class inclusion skills, as Piaget claims, then differences would arise between children who are able to solve class inclusion problems and those who are not. In their study, 72 children (range=6-7) were submitted to two different questions with different stimuli (7 blue and 3 red cars and 8 white and 4 black marbles, respectively). They used the standard Piagetian class-inclusion question adapted to the previous stimuli, and in order to pass the task successfully, children had to answer correctly to

both questions. According to the results in the class inclusion task, children were then assigned into the includers or the non-includers group (n=24 for each group), depending on whether they successfully answered both questions. Afterwards, the two groups were asked to produce definitions for nine common nouns in three different categories (e.g., *cow*, *cat*, *table*, *sofa*, *doll*, *ball*, etc.). Results revealed no significant differences between the two groups of 7-year-olds (includers and non-includers) in the production of superordinate terms in their definiens. Benelli et al., conclude that there are cognitive factors underlying the development of linguistic definitions, although they are not of the logical classificatory type, as their results showed that logical class inclusion capacity does not increase the number of superordinate terms in definitions of objects.

2. ***Mastering of linguistic expressions***. A different explanation on the acquisition and development of superordinate terms was proposed by Nelson (1978, 1979) and Markman (1984), who consider language "as the agent for the creation of categorical linguistic taxonomies". According to Nelson, superordinate terms refer directly to "*types*" and not to real objects, and this classification is given by the language and not by the world or by the conceptual system. Markman talks about "*class inclusion*" (for example, oak-tree) and "*collection relationship*" (for example, oak-forest); he argues that the distinction between *classes* and *collections* is linguistic in nature, because each *oak* is a *tree* but each *oak* is not a *forest*, that is, a hyperonym like *tree* can be applied to every single member of its taxonomic category, however, in collections, the term *forest* cannot be applied to every member as such. Language seems to be, for both authors, the main source of information that children have about how hyperonyms are linked to each other in order to form hierarchical conceptual systems. In the same line, other authors (e.g., Litowitz, 1977; Watson, 1985; Benelli, Arcuri & Marchesini, 1988; Snow, 1990;

Benelli, Belacchi, Gini, & Lucangeli, 2006) argue that the increasing mastery of linguistic, formal or conventional requirements on linguistic expression reflect the growth of category inclusion skills. According to Watson (1985) the "structural progression in the development of definition shows that the conventional linguistic form of the definition is being gradually articulated out of the more general forms of ordinary oral discourse", and, in her view, this is due to the gradual adoption of the conventions of a literate register through school, where the child is being "systematically led to adopt the conventions of a literate or scholarly register".

3. ***Metalinguistic Abilities***. Other approaches claim that metalinguistic abilities are involved in the development of superordinate terms. According to Wehren, De Lisi & Arnold (1981) and Watson (1985), in order to make adequate definitions children must not only know the 'object' denoted by the *definiendum*, but also know what a definition is. In this case, that a successful definition requires the use of a categorical term, which allows the listener to locate the target referent of the speaker into the appropriate global category (for example, a *cat* is an *animal*).

Although developmental researchers seem to agree on the fact that definitional skills involve metalinguistic components (Wehren et al., 1981; Watson, 1985; Snow, 1990; McGhee-Bidlack, 1991; Snow, Cancino, De Temple & Schley, 1991; Marinellie and Johnson, 2004; Skwarchuk & Anglin, 1997), a large number of studies have taken this as a theoretical assumption, without searching for empirical evidence of the relationship between definitional and metalinguistic skills.

Benelli et al. (2006) were the first to investigate the relationship between children's (range=5-13 years) and adults' (range=24-31 years) definitional competence and the following independent measures of metalinguistic skills:

(1) '*Lexical awareness*'. Requiring "reflection about the origin and nature of words" (e.g., 'Is *ball* a word or not? Why?'; 'Where do names come from?')

(2) '*Phonological-semantic awareness*'. Which according to the researcher would be "measuring students' awareness of phonetic aspects of words and their ability to differentiate between sound and meaning". The authors provide the following example: when children say, for example, that *ball* and *when* are words because they 'are made of letters', an initial conception of the phonological components is clearly taking place, but this conception is not yet integrated with the idea that language also involves semantic aspects.

(3) '*Concept of definition*'. Related to the conception of the child about the process that defining a word requires (e.g., 'Do you know what a definition is?' 'What does it mean to define a word?')

(4) '*Relations between words*'. Regarding *'synonymy'* (e.g., 'Could a cat be called a kitten?'), '*exchangeability'* (e.g., 'Could a cat be called a horse?') and '*superordination'* (e.g., 'Could a cat be called an animal?')

(5) '*Awareness of literacy*'. This measure concerns the child perception of the processes and functions involved in reading and writing (e.g., 'When you write something, such as a composition or some sentences, what is the most important thing to do?')

(6) '*Syntactic awareness*'. Involving judgement about the degree of correction of different types of sentences (i.e., 'syntactically wrong sentences; sentences with

incorrect content; sentences with a metaphoric use of language; and the equivalence of active/passive forms').

In their study, Benelli et al. (2006) rated definitions on a five-level scale taking into account both 'form' and 'content':

> "We placed particular emphasis on the role of the formal (morphosyntactic) aspects of language in children's definitional skills […] The underlying idea of our scale was that what really matters are not changes in the representation of content, as such, but the intrinsic property of articulated linguistic forms to highlight the pertinent conceptual features".

Although the authors state that the same content "can be expressed in different ways" and claim to have placed emphasis in the formal aspects of definition, they only considered as 'definitional' (their higher level in the scale) structures consisting on: 'definitional copula + introductory term + discriminating specification' (e.g., "a *clown* is a funny character you can see in circuses or shows'), and the use of equivalent terms (i.e. synonyms) in the case of adjectives and verbs (Johnson & Anglin, 1995). Therefore, their scale does not consider different levels of syntactic complexity, with the only exception of an explicit copula, but, on the contrary, they are placing emphasis mainly on the semantic dimension of definition.

Furthermore, it seems unlikely to be able to find out the "different ways to express the same content" as in their coding scale both formal and content aspects were coded together under the same categories. Notwithstanding, their results on the relationship between children's definitional competence and independent measures of metalinguistic skills show some interesting findings. Concretely, that lexical awareness, phonological-semantic awareness, and syntactic awareness predicted children's definitional skills. In the case of adults, they found that 'concept of definition' ("which can be seen as the

explicit cognitive-linguistic synthesis of the three metalinguistic components that predict definitional performances in children") and literacy ("formal analysis of the main processes and requirements of activities such as reading and writing") predicted adults' definitional skills.

Therefore, they conclude:

> "The general competence of reflection on different aspects of language can be considered the main factor accounting for the ability to 'transfer' the results of these reflections into adequate definitional formulae". This means that mastering formal definitional requirements (according to the authors a definition would need: semantic equivalence; absence of tautology; and a correct and complete syntactic structure in the form of definitional copula plus categorical term with specifications) is clearly a metalinguistic task".

In the authors' opinion, this is because definitional ability rests on "identification and analysis of what characterizes definitions as a culturally shared body of knowledge". In children, this type of identification is focused on each of the "main components of definitions: lexical awareness (which requires an understanding of what a lexical unit is) and phonological-semantic awareness (which applies to a conception of words as the combination of the two different, but integrated component of form and content). The other predictor is syntactic awareness, which is necessary to produce well-formed linguistic sentences and to 'shape' them into the appropriate Aristotelian definitional format".

4. ***Schooling and Metalinguistic Abilities***. Other explanations point to a conjunction of *schooling and metalinguistic abilities*. Benelli et al. (1988) showed that the use of hyperonyms correlates with a conception of words as "culturally derived devices to classify the world of objects, that is, with the decay of nominal realism […] children who are aware of the human, cultural origin of words, are also able to use superordinates, thus, showing their knowledge of language as a symbolic classificatory system with different levels of abstraction". Additionally, it has also been stated that schooling contributes to the gradual improvement of form and content of children definitions.

5. ***Pragmatic Approaches***. Among the *pragmatic approaches* proposed to account for the development of superordinate terms in children's definitions, we highlight the work of Watson (1995). According to Watson, providing a definition is simultaneously a cognitive and a communicative ability, and the *relevance theory* (Sperber & Wilson, 1986; Grice, 1989) provides the ideal framework to consider both aspects of definition. Sperber & Wilson (1986) argued that an utterance becomes relevant to a context if it has contextual effect (where context refers to the set of assumptions held by the listener). The degree of relevance of an utterance, thus, is determined by both the degree of contextual effect of the utterance and the processing effort required by the listener in order to determine that effect. Therefore, an utterance that provides the highest contextual effect with the least processing effort would be the most relevant. According to Watson (1995), superordinate terms are highly relevant to definition, as they bear a lot of information and, since they are single words, require a low processing effort from the listener. In this sense, the number of inferences or quantity of information encoded in superordinate terms is not the same one for all hyperonyms, which means that not every superordinate term is equally relevant to the meaning of every type of word.

Watson provides the following example: the superordinate *clothing* would encode inferences like 'can be worn', while a superordinate term like *animal* would encode inferences like 'it is alive' (or once was), 'it moves', 'reproduces', 'eats', etc. In this sense, natural kind hyperonyms would allow more inferences to be drawn by the listener on the basis of category membership than artifacts terms, like *clothing*.

Gelman (1988) showed that the pattern of inductive inferences that children make from category membership is different depending on the kind of category. Therefore, Watson argues that an hyperonym such as *animal*, which bears a large number of inferences, has a large contextual effect, and it should be more likely to be used in word definition according to *relevance theory*. Watson studied superordinate terms and basic-level word definitions of natural kind and artifact domains in 5-, 7- and 10-year-olds. She found that superordinates of natural kind domains were used more often than those of artifact domains, and children provided more complex expressions of meaning for natural kind superordinate terms than those in artifact categories. Furthermore, according to Watson, on the developmental perspective, it might be the case that children's expressions become increasingly relevant as they get better at other forms of linguistic, cognitive and social competence.

Although different, the previous theories, however, seem to agree on the notion that basic-level categories are the first to be acquired. Empirical support coming from linguistic data show that children's first object labels tend to be basic-level words[4] (Anglin, 1977; Brown, 1958). Thus, conclusions about the nature of the early concepts have been deduced from the application of these basic-level terms, on the assumption that linguistic usage directly reflects underlying conceptual structure (e.g., Mervis, 1987). They claim that children first form basic-level categories like *dogs*, *horses* or

[4] A basic-level category consists of objects that look very much like each other (maximize within-category similarity) and at the same time look quite different from the objects that compose neighbouring categories (maximize between-category dissimilarity) (Mandler, Bauer & McDonough, 1991).

rabbits, and only later they begin to group these objects into more inclusive categories, to end up forming a system of hierarchical classification (e.g., Rosch, Mervis, Gray, Johnson, & Boyes-Braem, 1976; Mervis & Rosch, 1981; Markman & Hutchinson, 1984; Saxby & Anglin, 1983).

However, other studies like the one by Mandler, Bauer & McDonough (1991) suggest caution in inferring the nature of children's categories on the basis of the labels that they use, since different data (for example, the previous reported data on spontaneous production of superordinate terms) has shown that the relationship between language and the underlying conceptual system is exceedingly complex (Mandler et al., 1991). The research by Mandler et al, (1991) with an object-manipulation task showed that very young children (as young as 16 months) have formed global conceptions of many of the domain of objects that are commonly referred to as *superordinate categories*: animals, vehicles, plants, furniture and kitchen utensils. In the case of animals and vehicles, their results show that although 18-month children make some differentiation, the resulting subclasses remain broader than what have usually been called *basic-level categories.* Their results are in line with the work of Keil (1979) who found that children's development of ontological knowledge proceeded in a downward direction, consisting of the gradual differentiation of a broad higher-level categories into increasingly narrow subclasses.

Cognitive psychology studies (Keil, 1989) resumed the Aristotelian definition regarding the concept of *quiddity* (i.e. 'the essential of the essence') to investigate children's conception of the essential characteristics (i.e. defining features) and the secondary characteristics (i.e. descriptive characteristics) in children's definition of a concept. One example of the difference in the semantic content between children and adults is the "characteristic-to-defining" shift proposed by Keil and Batterman (1984). Keil and

Batterman told short stories to 6-, 8-, and 10-year-old children, and then asked them to judge whether the story described a valid instance of the target definiendum. Their results showed that characteristic features (usually associated with a term but not absolutely necessary; in our study would be *descriptive characteristics*) are dominant in early word meanings, whereas defining features (i.e. definitional features), that is, features that are necessary and sufficient, are dominant in later definitions. On the same line, Sera, Reittinger & del Castillo Pintado (1991) investigated how Spanish children (range= 6-9 years old, n=128) differed from adults (range= not provided, n=16) in their definitions of objects and events, precisely, they wanted to examine the nature of developing word meanings. They found that reliance on definitional features increases with development and that reliance on characteristic features remains constant throughout development. Therefore, the differences they found between children and adults was in the relative importance of definitional and characteristic features, that is, with development, the importance that speakers assign to defining features increases. They also found that even the youngest children relied more on definitional than on characteristic features. According to the authors, this finding, that even the earliest word meanings are mostly based on defining features, is consistent with studies stating that even the earliest conceptual representations in children are criterial or "theory-based" (Gelman & Markman, 1986).

The extent to which young children incorporate abstract theories into their concepts, however, continues to be an area of ongoing debate (Rhodes, Gelman, & Karuza, 2014). Some researchers argue that children construct intuitive theories of the world and that our perception of the importance of features of taxonomical categories is influenced by our understanding of how and why category features–are related (Murphy & Medin, 1985).

In contrast, others have argued that early concepts are grounded in rudimentary domain-specific theories, and that these abstract theories play a critical role in the formation and development of concepts (Wellman & Gelman, 1992; Gelman & Koenig, 2003). Such beliefs are part of a cognitive bias known as "psychological essentialism" (Medin & Ortony, 1989), a bias that includes the notion of an essence being causally responsible for an entity's category membership and its phenomenal properties (Gelman, 2003; Keil, 2003, 2008). According to Keil, (2008) adults and children seem to believe that many sorts of things have essences. In this sense, an essence is often thought as "something intrinsic to an entity that causes that entity to be the kind of thing that it is". For example, the essence of a tiger would be some unique characteristic, such as DNA, that is shared by all tigers and causes tigers to have their distinct tiger properties (Sober, 1994). Much of the support for psychological essentialism comes from studies with young children. For example, children as young as 4 years old, appear to understand that internal causes are more likely to determine an object's behaviour and appearance than are external ones (Gelman, 2003; Gottfried & Gelman, 2005; Inagaki & Hatano, 2002; Newman, Herrmann, Wynn, & Keil, 2008) and they are likely to view internal properties as vital to determining an animal's category membership (Keil, 1989).

Artifacts, on the other hand, are not normally perceived as having essences in the same sense as natural kinds (Bloom, 1998). For example, while children and adults might think that tigers share a hidden internal property that makes them tigers, they would not think that of a clock (there are clocks with different appearances, and even in the case that a clock would break and could not tell time, it would still be a clock) because artifacts cannot be characterized only on the basis of external and superficial features (Bloom, 1998). One proposal on the categorization of artifacts is that children and adults possess intuitions about the creator's intended function and to the way that relates

to the external appearance of the artifact (Keil, 1989; Bloom, 1998).

Bloom (1998) proposes that artifact categorization is "an inferential process, drawing on assumptions about the relationship between an object's appearance and use and the intentions of its designer". On the other hand, Keil (1986) suggested that categories with defining features can be divided into those that are natural kinds (naturally occurring objects) and artifacts (objects produced or manufactured). And the distinction between the two would rest on the idea that a shared chromosomal or molecular structure is critical for natural kinds, for example, a certain molecular structure is required for something to be *water* (Keil, 1986; Putnam, 1975) while a shared intended function is critical for artifacts, for example, a chair is intended to be sat upon, regardless of whether it is made of plastic or wood (Keil, 1986; Schwartz, 1978).

In the context of our study, we have termed *definitional power* the expression of definitional features of a concept, which could be a function (as in the case of artifacts), a combination of definitional characteristics (for example the function plus defining characteristics), or the essence, in the sense of internal characteristics that made the object (e.g., animal, person, plant, etc.) have a specific external appearance, in short features that allow the listener differentiate the definiendum from other co-hyponyms included under the same hyperonym that the definiendum.

2.1.3 Developmental Studies on Syntactic and Semantic Dimension

Though numerous studies have analysed both form and content of definitions, fewer studies have explored the syntactic and semantic aspects of definitions as different and separated components. The first study to explore syntactic and semantic aspects of definitions in different dimensions, that is coding and analysing syntax and semantics separately, was the study conducted by Snow in 1990. The author analysed children's word definitions using a more thorough scoring system, compared to previous studies (e.g. Al-Issa, 1969; Watson, 1985; Wehren et al., 1981; Benelli et al., 1988). Snow documented a gradual improvement in children's definitions during the school-age years. Children from grades 2, 3, 4 and 5 (ages 7-11 years; n=137) defined 10 familiar nouns (e.g., *knife*, *umbrella*, *donkey*). Children responses were classified as formal or informal. Formal definitions included a specific hyperonym (e.g., *utensil*) or a general one (e.g., something; a kind of; or thing); informal definitions did not include either type of categorical term. Formal definitions were assigned points on several dimensions, such as syntactic complexity, quality of the categorical term (i.e. specific or general), and number of characteristics mentioned. Informal definitions were assigned points for the amount of information that was provided about the word. Results showed that 49% of the definitions were formal at second grade, but that 76% were formal at fifth grade. Moreover, as grade level increased, formal definitions became more sophisticated, whereas informal definitions remained static in quality.

So far, up to this point in our exposition, the studies presented were centred in production of definitions and researchers have tried to show that some definitions are more adequate than others. However, communicative contexts, as we explained in section 1.2.3, have a strong influence on the criterion of what constitutes a good definition. Researchers on this pragmatic perspective (Bruner & Olson, 1978; Bruner, 1986; Watson, 1985; Watson & Olson; 1987) have conducted different developmental studies to demonstrate the relationship between communicative contexts and the conception of a definition as 'good' or 'appropriate'. These authors claim that speakers use precise and different criteria in evaluating the requirements definitions should have in order to be "acceptable" and informative. Furthermore, they consider that this evaluation is not an abstract process, but a process 'sensitive' to different specific interactional contexts and objectives of definitions.

Benelli, Arcuri, & Marchesini (1988) aimed at obtaining "normative data", according to adult conventional criteria, on the appropriateness of definitions provided by children and adults. As it is well known, messages vary according to, for example, the number of alternatives or the presuppositions speakers have about listener's notions (Olson, 1970). For this reason, they submitted children and adult definitions to a group of adult university students to 'judge' with a score from 1 to 7 those sentences they considered as the best definitions and those they considered as the worst (this would be the Standard Definition Condition). Additionally, two groups of adult university students were asked to 'judge' the same definitions, with the objective of evaluating the effect of different specific communicative contexts on the 'goodness' of that definition, namely: 'rate the stimuli as if you had to make a child understand what an X is' and 'rate the stimuli as if you had to explain it to a being arriving from Mars'. They expected to find differences between what adults in the two different conditions (i.e. standard vs.

child/Martian) would consider as more acceptable definitions as a function of the communicative context, because the main aim in an interactional context is to allow the interlocutor to access the target *definiendum*, rather than following formal-linguistic definitional requirements. They found that what was rejected in the Standard Definition Condition was tolerated if the interlocutor was someone who had to learn to know the objects around him. For example, a definition containing a descriptive and a functional characteristic like: 'sofas have cushions and are to sit on' reached higher scores if the judge thought he was speaking to a child or a Martian than if they were required to think of the best way of defining a *sofa*. Additionally, while definitions consisting solely on a superordinate term received a high score in the Standard Definition Condition, they received low scores in the child and Martian conditions. In other words, a definition such as 'tigers are animals' were not considered effective to make a 'naïve observer' understand the specific nature of the defined object.

2.1.4 Developmental Studies on the Effect of Word Category

Studies from the previous sections on the development of word definitions, have shown that different investigators analysed children's definitions of one word category: nouns. Generally, investigations found that, from early childhood to adolescence and adulthood, noun definitions slowly develop from functional, concrete, and instance-oriented to more abstract and conceptual (e.g., Al-Issa, 1969; Anglin, 1977; Fiefel & Lorge, 1950; Storck & Looft, 1973; Swartz & Hall, 1972; Werner & Kaplan, 1963). According to Marinellie and Johnson (2004), and taking into account the previous research in noun definitions, a definition that contains a superordinate term plus distinguishing characteristics in a modifying clause (e.g., "a rose is a *flower that smells pretty*") is referred to as *formal*, Aristotelian, or dictionary type. Therefore, the development of noun definitions is characterized by improvements in content (e.g. superordinate terms) and grammatical form (e.g., "X is a Y that Z"). But what do we know about the development of adjective and verb definitions? Adjectives have been studied for their role in vocabulary acquisition (e.g., Benedict, 1979; Clark, 1972; Nelson, 1976), but investigations of the ability to define adjectives, however, are fewer in number. Storck and Looft (1973) studied qualitative changes in vocabulary performance across the life span using the words from the vocabulary subtest of the Stanford-Binet Intelligence Scale, which includes adjectives. They found that the use of synonym-type definitions increased gradually from childhood to young adulthood. Markowitz and Franz (1988) investigated definitions of nouns, adjectives and verbs in children and adults, but their findings for adjectives were not conclusive, as they found that children and adults who provided well developed noun and verb definitions had a tendency to use different types of definitional forms for adjectives, including noun forms (e.g., *contagious*: "something you can catch"), verb form (e.g., *smart*: "being able

to give the responses that one wants to hear"), and adjectival form (e.g., *hazardous*: "dangerous"). In the case of verbs, they suggested that verbs may have a conventional definitional form similar to nouns. In the same line, Johnson & Anglin (1995) systematically studied qualitative development in the content and form of children's definitions of nouns, verbs, and adjectives in Grades 1, 3, and 5. They found that, overall, children were more successful in providing precise word meaning (content) than in using conventional definitional form (syntax). Johnson and Anglin resumed the *principle of substitutability* applied in lexicographic definitions to determine the type of syntactic conventional form present in the definition, that is, the structure of the definiens needs to match that of the definiendum; in that sense, a noun phrase definiens should be used for a noun definiendum, a verb phrase definiens for a verb, and an adjectival phrase definiens for an adjective). Results of their study indicated that children achieved earlier mastery of form for nouns than for other parts of speech. For adjectives and verbs, difficulty seemed to lie in mastering conventional definitional form, but not in expressing accurate semantic content. Two years later, Skwarchuk & Anglin (1997) carried out a study with the same characteristics as the one of Johnson and Anglin, but concentrated on the study of superordinate terms of noun, adjective and verb definitions of children in grades 1, 3, and 5. Their results indicated that nouns definitions contained a higher percentage of superordinate terms (29%) compared to adjectives and verbs, and that the quality of these superordinate terms increased with age. To explain these findings, both Johnson & Anglin (1995) and Skwarchuk & Anglin (1997) argued that nouns more often lead to activation of a superordinate term, which in turn served as an "organizing element" around which a high-quality definition can be formed. In contrast, Johnson and Anglin found that adjectives and verbs do not

consistently activate a superordinate term, which makes production of a well-formed definition more difficult.

Marinellie and Johnson (2003) studied the development in the content and form of high-and-low-frequency adjective definitions in 12-, 16-, and 20-year-olds (n=150). Participants were asked to write definitions for six high frequency adjectives (e.g., *beautiful*, *dark*, *heavy*) and six low frequency adjectives (e.g., *ambitious*, *defective*, *elegant*). Prior to completing the task, the participants were provided with examples of "acceptable" dictionary adjective definitions that deployed a variety in the type of content (i.e., synonyms, qualities, negations, explanation) and in the type of form (i.e., noun, verb, adjectival) taking as a reference the study by Nippold et al. (1999); and were also given two examples of poor definition with "incorrect information" (e.g., glad means unhappy). Every instance of a given definiens was coded for content and form, for example, a definiens like: "pretty, not ugly" for the word *beautiful* was coded for content as *synonym* and as a *negation*; and a definiens like: "youth, having a lot of energy" for the word *young* was coded for form as *noun form* and *verb form*. Results for content showed that adults provided explanations more often than the younger groups, and they used superordinate terms more often than the 12-year-old group. However, superordinate terms were not frequently used overall by adults. Therefore, as Johnson and Anglin (1995) they conclude that adjectives do not as often activate a superordinate term around which to formulate a definition. Results for form showed that adjective (e.g., "pretty" for *beautiful*) and verb forms (e.g., "to give" for *generous*) accounted for most of the syntactic structures. They expected to find an increase with age in the use of the "conventional form" (i.e., defining an adjective with another adjective) to define adjectives. However, they found that the use of and adjective form decreased with age, and adults used more verb forms (i.e., "used to describe exquisite things" for *elegant*)

than the two younger groups. They conclude that verb forms appear to be the adult-like form to define adjectives.

Marinellie and Johnson (2004) studied how verb and noun definitions of school-age children (9-, 10- and 11-year-olds, n=30) differ in both semantic and syntactic dimensions. Children were asked to provide oral definitions for 20 high frequency nouns and verbs (e.g., *apple*, *baby*, *boat*, *climb*, *eat*, *jump*, among others). Taking the study by Johnson & Anglin (1995) as a reference for their coding, answers consisting on a combination of a superordinate term with characteristics (e.g., "a fruit that is red" for *apple*) were scored at the highest content category for nouns, and answers consisting on a description of an action (e.g., "to look at words and understand their meanings" for *read*) or a combination of a superordinate term with characteristics (e.g., "a sport that keeps you fit" for *swim*) were scored at the highest content category for verbs. Regarding form, answers consisting on the "Aristotelian form" (i.e., a/n Y that is Z or a/n Y that Z's), for example "a type of clothing you wear in the cold" for *coat*, were scored at the highest form category for nouns. Additionally, answers consisting on an infinitive plus a verb phrase or a prepositional phrase (e.g., "to allow yourself to move" for *walk*; "to propel something with your arm" for *throw*), and answers consisting on an "Aristotelian definition" (e.g., "swimming is a motion that involves the arms" for *swim*) were scored at the highest from category for verbs. Results for the syntactic dimension showed that, overall, 56% of verb definitions contained phrases, clauses or simple sentences, this one being the category with the highest percentage use for all groups of age. In the case of nouns, 45% of the definitions contained a "transitional" structure (e.g., "something that you read" for *book*), while 28% contained an "Aristotelian" or formal structure (e.g., "an animal that runs fast" for *horse*). Had they considered the "transitional" structure as formal or "Aristotelian" -which it is for us only in terms of

syntactic structure, as the only difference between their "transitional" and their "Aristotelian" structure is the low level of specificity of the hyperonym in the former-, then a 73% of noun definitions would have exhibited a formal or "Aristotelian" definitional structure. The percentage of formal definitions ("Aristotelian") for nouns and verbs increased with age, though higher percentages were found for nouns.

Results for the semantic dimension showed that 44% of verb definitions were partial and full descriptions of actions (e.g., *read*: "to look at words", "to look at words and understand their meaning", for partial and full descriptions, respectively); additionally, full descriptions of actions increased with age, while partial descriptions of actions decreased with age. In the case of content for nouns, 37% of responses were descriptive characteristics (e.g., "it's little and it cries" for *baby*) and 30% of answers were of the function fulfilled by the definiendum (e.g., "you read it" for *book*). Function answers decreased with age, whereas descriptive-characteristic answers increased with age. Even though definitions with an hyperonym plus descriptive characteristics (e.g., "a fruit that is red" for *apple*) increased with age, they did not reach the highest percentage of use even for grade-5 children.

In order to account for the previous findings, both Johnson & Anglin (1995) and Marinellie & Johnson (2003, 2004) argued that the variation in the definition of nouns, adjectives and verbs may be explained by the organization of the mental or internal lexicon. Some researchers believe that lexical organization is different for nouns, verbs, and adjectives. Nouns may have simpler, more predictable semantic relations than verbs and adjectives. Findings from investigations of the mental lexicon suggest that nouns are closely related to each other and are organized as lexical categories, in hierarchies of superordinate and subordinate connections with other nouns (e.g., Markman, 1989; Miller, 1991; Rosch & Mervis, 1975). According to Markman (1989) nouns are

structured categories stored in richly interconnected networks. Bock & Levelt (1994) offer the following example to illustrate Markman's argument: "there are conceptual links that store the meaning of words, links such as 'is-a' between *dog* and *animal* or a 'can' link between *dog* and *bark*". In contrast, semantic relations for verbs and adjectives may be less structured and less predictable. Verbs may be represented by non-hierarchical dimensions such as *change*, *intentionality*, *causality*, and *manner* (Miller, 1991). Adjectives, on the other hand, may be represented mostly by antonymous relations (oppositions). Although it is thought that lexical categories for verbs and adjectives are organized differently than those for nouns in the mental lexicon, verbs and adjectives are considered to be a noun-dependent lexical category. Verbs and adjectives are not only linked to members of their own part of speech, but also related to nouns (Gentner, 1982; Markman, 1989). This is evident in argument structure for verbs, in which different subcategories of verbs occur with specific subjects or objects (Pinker, 1989). From a developmental standpoint, normally developing children learn verbs at a slower rate than nouns, suggesting that verbs may be more difficult to learn (e.g., Benedict, 1979; Gentner, 1978, 1982; Greenfield & Smith, 1976; Huttenlocher, 1974). In addition, investigators have observed that classroom teachers encourage and expect students to provide "good" definitions of nouns, namely, ones that include an appropriate categorical term such as *song* for *lullaby* (e.g., Watson, 1985; Snow, Cancini, González, & Shriberg, 1989). Snow (1990) reported that the development of definition is strongly facilitated by the opportunities to hear and practice models of definitions. Perhaps children gain more exposure and practice defining nouns than adjectives and verbs in the course of typical school instruction.

With the exception of the study by Sera, Reittinger & del Castillo Pintado (1991), the attempts to study the development of word definition in Spanish are scarce, and the few studies available are based mostly on qualitative analyses of word definitions. The study by Rojas-Murillo (2014) explored pedagogical possibilities of noun, adjective, and verb definitions in 7-, 8-, 9-, 10-, 11-, and 12-year-old Costa Rican children (n=216) with the final aim to apply the findings to vocabulary teaching in a school context. Children were asked to provide oral definitions for 5 nouns (*ropa* 'clothes', *familia* 'family', *alimento* 'foodstuf', *arroz* 'rice', and *cabeza* 'head'), 2 adjectives (*bonito* 'pretty', and *inteligente* 'intelligent'), and 3 verbs (*jugar* 'to play', *compartir* 'to share', and *estudiar* 'to study'). Answers were analysed for idiosyncratic definitions (i.e., "definitions based on the child's personal experience", for example "*digamos*, *yo me visto bonito*" 'for example, I dress myself nice' for *bonito* 'nice') versus conventional definitions (i.e., "any definition which was not considered idiosyncratic", for example, "*que algo es realmente precioso*" 'that something is really beautiful' for *bonito* 'nice'); and for autonomous definitions (i.e., "basic meaning with no reference to context or particular situations") versus context-situation bound definitions (i.e., definitions linked to particular contexts or situations, for example, "*para pensar*" 'for thinking'; "*lleva por dentro el cerebro y por fuera el pelo*", 'it carries the brain inside and the hair outside' for *cabeza* 'head'). They carried out a frequency analysis word by word, therefore age or word category effects could not be reported. Notwithstanding, the examination of the results they obtained for each word, and according to the author, showed that children provided more conventional than idiosyncratic definitions, and that the use of idiosyncratic definitions decreased with age only for the adjective *intelligent*. Additionally, older children relied less on context and situations and provided more autonomous definitions. Finally, regarding word category, nouns presented a higher number of

autonomous definitions than adjectives and verbs (we want to remark the fact that these results are not based on statistical analyses or comparisons).

In the same line Hernández Delgado (2008) studied form and content of noun definitions in Costa Rican children from five different age ranges: 4 to 5; 5 to 6, 7 years old; 8 to 9; and 10 to 11 years old (n=20). Children were asked to provide oral definitions for 16 superordinate and basic-level concrete nouns (e.g., *ropa* 'clothes', *alimento* 'foodstuff', *pantalón* 'trousers', *arroz* 'rice') and 14 abstract nouns (e.g., *confianza* 'confidence', *miedo* 'fear', *espacio* 'space', *música* 'music').

Analysis for form considered the element with which children started their definiens (e.g., copula plus relative complementizer, for example, "*es que*…" 'is that…'), that is, the grammatical category of the first element of the definiens (i.e., whether it was a noun or a noun phrase) and idiosyncratic versus conventional definitions.

Analysis for content considered autonomous versus content-situation bound definitions; superordinate terms; and semantic strategies deployed (e.g., synonym, hyperonym, hyponym, comparison, function, and characteristics, among others). Results based solely on frequency percentages of answers for form showed that, according to the author, children's definiens were overall initiated with a syntactic element; that there was an effect of age in the syntactic resources children used in their definiens; and that conventional definitions were higher in number compared to idiosyncratic definitions. Results for content (based solely on frequency percentages of answers) showed that, according to the author, there was a low use of hyponyms and hyperonyms in all groups of age and a high number of semantic circularity in the content of children's definiens. The author concluded that there was an effect of the level of abstraction of the definiendum on the form and content of children's definiens.

2.1.5 Developmental Studies on the Effect of Level of Abstraction of Words

Despite the improvements reported in developmental studies of definition for syntactic and semantic dimensions with age/school level, definition tasks can be challenging, even to adults, particularly when abstract or less familiar words are presented. With the exception of Storck and Looft (1973), the developmental studies, presented so far, examined word definitions of common nouns that referred to tangible objects. There is evidence that indicates that words that have tangible referents ("concrete") are easier to define than those not having such referents ("abstract"). The first developmental study that systematically examined the ability of children and adolescents to define abstract nouns was the one by McGhee-Bidlack (1991). McGhee-Bidlack asked students of ages 10, 14, and 18 (n=120) to define 16 nouns. Half the nouns were concrete (e.g., car, book flower) and the other half were abstract (e.g., wisdom, courage, freedom). Results indicated that, for all three age groups, concrete nouns were easier to define than abstract nouns. Whereas concrete nouns were defined mainly in terms of their superordinate term and characteristics (e.g., "A flower is a plant that has colourful petals"), abstract nouns were defined mainly in terms of their characteristics, with their superordinate terms often omitted (e.g., "Freedom means you can do what you want to do"). Definitions of both types of nouns gradually improved as student age increased, but even at age 18, definitions of abstract nouns were far less sophisticated than those of concrete nouns, often lacking the appropriate superordinate term. In an effort to explain the improvements that might occur in word definition of abstract nouns beyond the adolescence years, Nippold, Hegel, Sohlberg, & Schwarz (1999) extended the study of McGhee-Bidlack into adulthood, documenting a gradual, though slow, improvement in student's abstract noun definitions from adolescence to adulthood. Participants from grades 6, 9, 12, and university students (ages 12-23 years, n=60) wrote definitions for

16 abstract nouns (e.g., *burden*, *misfortunes*, *gratitude*, *expectation*). Students' definitions were assigned points on two elements: (a) accurate superordinate term (e.g., *envy*: "an emotion"; *friendship*: "a relationship"); and (b) one or more accurate characteristics of the word (e.g., *sorrow*: "a feeling of anguish or grief resulting from a great loss"). Definitions that included an accurate superordinate term and one or more accurate characteristics of the word were assigned the higher score (score 2). Results showed that defining abstract nouns is a challenging task even for adults, as they were able to provide "fully acceptable responses" (score 2) to only 58% of the words. However, 23-year-olds outperformed the younger groups, reflecting higher knowledge of the target word, the superordinate category term and the accurate characteristics of the words. Additionally, adult responses contained more details about the words (e.g., indicating awareness that the word *burden* could have both literal and figurative interpretations), suggesting higher breadth and depth of knowledge.

Regarding the effect of concreteness on definition, the first study involving only adults was the one conducted by Reynolds and Paivio (1968). They investigated the production of oral definitions of concrete and abstract words. That study involved 48 undergraduates, identified as either high or low in verbal-associative productivity (i.e., the number of words produced as associates of a given list of words), who were given 30s per word to orally define five concrete and five abstract nouns equated for frequency of usage and meaningfulness. Definitions of concrete words had shorter latencies, contained more words, included shorter words, and were rated higher in quality than definitions of abstract words. High associative productivity students produced shorter latencies, more words per definition, and definitions rated higher in quality. In 1997, Sadoski, Kealy, Goetz & Paivio (1997) investigated the effects of concreteness and imagery on the processes and products of composing written

language, extending the work of Reynolds and Paivio (1968) to writing. Sadoski et al., (1997) presented concrete and abstract nouns matched for rated familiarity and meaningfulness to undergraduates who provided written definitions on microcomputers. The study of Sadoski et al., replicated and extended the study by Reynolds and Paivio (1968) where oral language was used for the definitions. The concrete words in both studies were *library*, *prisoner*, *picture*, *hotel*, and *mother*. The matched abstract words were *crime*, *science*, *mind*, *fun*, and *death*. The dependent measures involved the quality and ease of producing the definitions, and the use of imagery and verbal strategies in doing so. These measures included: latency (i.e., the time from the presentation of the word to the first keystroke); the number of words in the definition; the average length of the words in the definition; the number of T-units (i.e., an independent clause with all its modifiers including dependent clauses) and the percentage of T-units with a final modifier (i.e., cumulative constructions, a syntactic variable consistently related to the rated quality of writing (Hillocks, 1986; Sadoski & Goetz, 1998); a content score based on the criteria of a good definition; a style score based on the grammaticality and textuality of the definition; the rated use of an imagery strategy (1–4 scale for the use of mental pictures of objects, scenes, or events as a composing strategy); and the rated use of a verbal-associative strategy (1–4 scale for the use of other words, phrases, and related language as a composing strategy). Two experiments were conducted. The first experiment used a restricted time limit in which adult participants had 90 seconds to write a definition for each word. Results showed that when participants composed definitions for the concrete terms, they began sooner, wrote longer definitions, wrote definitions judged higher in quality by reliable ratings, used more final modifiers, and reported more use of an imagery strategy. When they composed definitions for abstract terms, they used longer words and reported more use of a verbal-associative strategy.

The second experiment presented each participant with one concrete word and one abstract word from the original set, and used a more extended time limit (15 minutes per word) with instructions to write a complete and polished paragraph of definition in that time. Results showed that when participants composed definitions for the concrete terms, they began sooner, wrote marginally longer definitions, wrote definitions higher in quality, and reported more use of an imagery strategy. When they composed definitions for abstract terms, they reported a higher use of a verbal strategy. The results of the two experiments generally replicated those by Reynolds and Paivio (1968) and were interpreted as supportive of Dual Coding Theory (cf. Sadoski & Paivio, 2001).

2.2 Objectives

The study of word definitions from a developmental perspective demands a separate consideration of its formal –syntactic structure– and content dimensions –semantic content. Researchers in developmental study of word definitions argue that the prototypical syntactic structure for *noun* definitions would be a *relative clause* that includes a *superordinate term* (*hyperonym*) and definitional features. According to this prototypical-formal-structure proposal, children's definitions for nouns tend to be classified on the dichotomy: *formal* vs. *non-formal* definition. Being considered as formal only those definitions presenting the following structure: 'An X is a Y that Z', where both *Y* and *Z* positions would be occupied by semantic aspects, in this case, the Y position would be occupied by an hyperonym, and the Z position would be occupied by semantic definitional features.

We examine 7-year-old children's noun, adjective, and verb definitions in Spanish. Our objective is to determine the effect of the characteristics of the words and the students in the syntactic and semantic dimensions of word definitions. As for the characteristics of the words, we examine the effect of the morphological category and level of abstraction of the definiendum on the syntactic and semantic dimensions of the definiens. Concerning the characteristics of the students, we examine the effect of the age of the children in the syntactic and the semantic dimensions of the *definiens*.

2.3 Hypothesis

We expect significant differences in the syntactic and semantic dimension of the *definiens* as a function of the morphological category and the level of abstraction of the *definiendum*. However, given the limited range of the age of the children (from 6 to 7 years old) we do not expect significant age differences.

Our specific questions for the morphological category of words for this first study are: (a) what differences are we going to find in participants' definitions of nouns, verbs and adjectives? (b) what differences can be identified in the syntactic dimension and which in the semantic dimension? (c) how do the two dimensions of word definition relate to each other?

Based on prior research (Marinellie & Johnson, 2003, 2004) we expect that the syntactic structure of the verbal utterances children produce for nouns, verb and adjectives will differ. Children's noun definitions would contain more relative clauses than adjective and verb definitions, as nouns are thought to readily activate a hyperonym that then serves as a platform for building a relative clause, whereas lexical relations for adjectives and verbs may be less structured and less predictable than those of nouns.

Furthermore, it is reasonable to assume that children have been more exposed to definition of nouns that to definition of adjectives and verbs and, therefore, they may have a greater facility with the syntactic form of noun definitions.

As for the semantic dimension, based on prior research in the semantic dimension of noun definitions (Skwarchuk & Anglin, 1997; Johnson & Anglin, 1995; Marinellie & Johnson, 2004) we speculated that children's noun definitions would contain more hyperonyms and of better quality than adjective and verb definitions, as nouns are

believed to have clearer referents and to be conceptually simpler than verbs or adjectives.

As regards the level of abstraction of the definiendum, our specific questions for this first study are: (a) what differences are we going to find in children's' definitions of words that differ in the level of abstraction (b) what differences can be identified in the syntactic dimension and which in the semantic dimension? (c) how do the two dimensions of word definition relate to each other?

Based on prior research in older children and adolescents (McGhee-Bidlack, 1991; Nippold, Hegel, Sohlberg, & Schwarz, 1999), we predict that words with a higher level of abstraction would contain less hyperonyms, of less quality and less differential features than words with a low level of abstraction. However, due to the lack of previous studies on the effect of level of abstraction, we do not have specific predictions for a possible effect of the level of abstraction on the syntactic structure of children's definitions of noun, adjectives and verbs.

2.4 Method

2.4.1 Participants

A total number of 139 participants took part in our study, 73 boys and 66 girls, with a mean age of 82.27 months (range 73-88 months, SD=3.4). These children constitute a sub-sample of a group of 813 children from a larger project that explored the contribution of children's knowledge and teaching practices to the learning of the written language from the ending period of their Kindergarten Education (in which they start to receive formal writing training) until the ending of their first year of Primary Education. The aim of this project was to evaluate the knowledge of children about notational aspects of the written language, metaphonological abilities and lexical knowledge at this initial training period. For the present study, we selected children from six different Spanish communities: *Andalucía*, *Asturias*, *Cantabria*, *Castilla y León*, *Madrid* and *Comunitat Valenciana*. In the case of the *Comunitat Valenciana*, we only selected eight children that came from a Spanish dominant language context, both in their social environment and in the school, where the teaching language was Spanish, and *Valencià* (variety of *Catalan*) was only taught as a second language. In order to avoid a potential difference between the children in the *Comunitat Valenciana* (n=8) and the children from the rest of the communities, we added *community of origin* as an independent variable in our analyses, to make sure it will not affect neither the syntactic nor the semantic dimensions of the children's *definiens*.

2.4.2 Task and materials

Among the different tasks used in this general project, we selected the task of *word definition* for our study. Our aim is to go deeper in the characteristics of word definition at 7 years of age by examining the syntactic structure and the semantic aspects of the participants' definiens. The materials used for our study consists on 32 words, of which 20 of them are nouns (*cuchillo* 'knife', *reloj* 'clock', *paraguas* 'umbrella', *ladrón* 'thief', *sombrero* 'hat', *burro* 'donkey', *bicicleta* 'bicycle', *clavo* 'nail', *diamante* 'diamond', *estorbo* 'nuisance', *disparate* 'absurdity'/ 'nonsense', *alfabeto* 'alphabet', *fábula* 'fable', *escarabajo* 'beetle', *campanario* 'bell tower', *estrofa* 'verse', *espionaje* 'espionage', *rivalidad* 'rivalry', *aflicción* 'affliction' and *enmienda* 'emendation'); 5 of them are adjectives (*valiente* 'brave', *contagioso* 'contagious', *peligros*o 'dangerous', *inminente* 'imminent' and *dilatorio* 'dilatory'); and 7 of them are verbs (*juntar* 'to join', *aislar* 'to isolate', *prevenir* 'to prevent', *apostar* 'to bet', *emigrar* 'to emigrate', *urgir* 'to urge' and *omitir* 'to omit'). The number of words in each morphological category reflects the real distribution of them in the lexical databases (Martínez & García, 2004).

2.4.3 Procedure

We asked each participant to orally define the 32 words, which were presented in an increasing difficulty order. The researcher read out loud each word in Spanish and asked the child to provide a definition with the following instruction: *¿Qué es un/a X*? 'what is a/an X?' for nouns and *¿qué es X*? 'what is X?' for adjectives and verbs. If the answer of the child was too vague or if it lacked in clarity the researcher could ask: *¿Quieres decir algo más*? 'do you want to say anything else?' or *¿qué quieres decir*? 'what do you mean?'. If the answer of the child was a gesture or if the child pointed to an object the researcher could ask: *Sí*, *pero ¿qué es X*, *me lo puedes decir con palabras*? 'yes, but what is X, can you use your words?'. If the child gave signs of not having understood the word, the researcher was allowed to repeat the question *¿Qué es X*? 'what is X?' one more time. Under no circumstances the task was discontinued, even in the case the child answered *don't know* to more than five words in a row. We interviewed every participant individually and each interview had a total duration of 20 minutes. The interviews were carried out in a different room from the regular classroom in order to facilitate the child's concentration on the task. Once the data gathering phase was completed, we transcribed the children's interviews and coded them according to the criteria that we will present in the following epigraph.

2.4.4 Internal validation of word difficulty

The words were presented in a crescent difficulty order, and were selected from the test *WISC-IV*[5] (*Escala de Inteligencia de Wechsler para Niños-IV* 'Wechsler Intelligence Scale for children-IV') and other ad-hoc considerations of the researcher. Our final word selection was confronted with the dictionary *Diccionario de Frecuencias del Castellano Escrito en Niños de 6 a 12 años* 'Written Spanish Frequency Dictionary in 6 to 12-year-old Children' (Martínez and García, 2004) in order to obtain a measure that would allow us to validate our instrument. This dictionary counts the lexical entries that a middle-class child schooled in an urban context would encounter in texts and reading books read to them or by them during the primary school. The aim of the dictionary is to document how many words a child has read, on an average, throughout an academic year –both in academic texts and school books– as well as in the books and readings that the child voluntarily reads in his leisure time and during the holidays. We used the dictionary as a measure to internally validate the instrument, that is, we examined the relationship between the difficulty of the word in the instrument (*WISC-IV*) and the frequency of use of the words in texts and reading books read by the children during first and second grade of the primary school.

[5] The word definition task is one of the tests of the batery of tests *WISC-IV* (*Escala de Inteligencia de Wechsler para Niños-IV*). This scale is a clinical instrument of individual application that serves to evaluate the cognitive capacities of children among 6 years and 0months and 16 years and 11 months of age. The objective of this standarized task in the context of the test batery is to evaluate the vocabulary knowledge of children based only in semantic criteria, without taking into account aspects of the syntactic stucture of the definiens. The battery of test of *WISC-IV* is conforomed by 15 nouns (*reloj* 'clock', *vaca* 'cow', *ladrón* 'thief', *paraguas* 'umbrela', *bicicleta* 'bycicle', *isla* 'island', *abecedario* 'alphabet', *disparate* 'nonsense', *fábula* 'fable', *molestia* 'disturb', *rivalidad* 'rivalry', *previsión* 'prevision', *aflicción* 'afliction', *enmienda* 'enmend' and *dilación* 'dilation'), 10 adjectives (*valiente* 'brave', *aterrador* 'frightening', *antiguo* 'antique', *habitual* 'usual', *agotador* 'tiring', *transparente* 'transparent', *preciso* 'precise', *inminente* 'imminent', *unánime* 'unanime' and *locuaz* 'locuaz') and 7 verbs (*obedecer* 'to obey', *imitar* 'to imitate', *abandonar* 'to abandon', *emigrar* 'to emigrate', *obligar* 'to oblige', *absorber* 'to absorb' and *alardear* 'to flirt').

We found that the difficulty of the words in the instrument was inversely and significantly related with the frequency of use of the words in texts and books read by the children in their first and second year of primary education, $r = -.68$, $p < .01$. This large effect indicates that the higher the difficulty of the words in the instrument gets, the lower the frequency with which we find these words in the written texts to which 7-year-old children are exposed. The words considered as more difficult in the instrument are less frequent in the written texts in the first and second year of the primary school. The words with a higher difficulty usually correspond to words that have a more specific meaning and, therefore, are less frequently found in both oral and written language. These results indicate that the level of difficulty of the words used in our study reflects the levels of use of the words for which a definition is solicited.

2.4.4.1 Level of abstraction of the definiendum

As the level of abstraction of the definiendum is one of the characteristics likely to affect the syntactic and semantic dimensions of the definition, we carried out a mini-study to determine the level of abstraction of the words in our instrument.

2.4.4.2 Participants

We gathered subjective estimations from 35 adults with a mean age of 24.5 years (range= 22-30), who were students of the *Bachelor Degree in Linguistics* at the *University of Barcelona* at the time the data was gathered.

2.4.4.3 Task

The materials used for this study are the 32 words in our instrument. 20 nouns (*cuchillo* 'knife', *reloj* 'clock', *paraguas* 'umbrella', *ladrón* 'thief', *sombrero* 'hat', *burro* 'donkey', *bicicleta* 'bicycle', *clavo* 'nail', *diamante* 'diamond', *estorbo* 'nuisance', *disparate* 'absurdity'/ 'nonsense', *alfabeto* 'alphabet', *fábula* 'fable', *escarabajo*

'beetle', *campanario* 'bell tower', *estrofa* 'verse', *espionaje* 'espionage', *rivalidad* 'rivalry', *aflicción* 'affliction' and *enmienda* 'emendation'); 5 adjectives (*valiente* 'brave', *contagioso* 'contagious', *peligros*o 'dangerous', *inminente* 'imminent' and *dilatorio* 'dilatory'); and 7 verbs (*juntar* 'to join', *aislar* 'to isolate', *prevenir* 'to prevent', *apostar* 'to bet', *emigrar* 'to emigrate', *urgir* 'to urge' and *omitir* 'to omit').

Procedure

We asked each participant to mark with a cross the level of abstraction of the words provided. We built a table containing the 32 words of our task ordered in the same increasing difficulty order presented in our instrument. In order for each participant to evaluate the degree of abstraction of each word in our sample, we used a Likert scale of 6 points, where 1 corresponded to the lowest level of abstraction of a word and 6 to the highest level of abstraction. The instruction provided to the participants was the following: "*Marca con una cruz el nivel de concreción de las siguientes palabras*, *el 1 indica el nivel de mayor concreción y el 6 el nivel de mayor abstracción*. *No te detengas a pensar demasiado*, *utiliza tu intuición*", 'mark with a cross the level of concreteness of the following words. Number 1 stands for the highest concretion level and number 6 for the highest abstraction level. Do not think on it too much, use your intuition'. The participants did not receive any indication or instruction regarding word's abstractness criteria. The individual punctuations were entered into a matrix for subsequent analyses.

2.4.4.4 Results

To determine the level of abstraction of the words in our instrument, we averaged the values received from the 35 evaluators per each word in the study. To ensure that the variation across words was higher than the variation within a word across evaluators, we performed a preliminary analysis to measure intra-class correlations (ICC) of the data per word level and per evaluator level.

Results on the analysis performed to measure the ICC of words and evaluators indicated that the value of the ICC for the word level was .48, which indicates high variation between words and low variation within words across evaluators. The ICC value for the evaluator's level was lower (.17), yet above the common threshold. This means that the evaluators were not consistent among themselves. Therefore, words were evaluated in a similar way by different evaluators as the variation within words was low. These results validate the evaluation of the level of abstraction of the words in our instrument, as the analysis showed that the evaluators' estimations on the level of abstraction of the words depended more on the word than on the person evaluating them. Table 1 below presents the mean values on abstraction level for each word in our instrument.

Table 1

Mean of Abstraction per Word

Word nº	MC	Task words	Translation	Mean
3	N	paraguas	umbrella	1.14
7	N	bicicleta	bicycle	1.17
1	N	cuchillo	knife	1.26
18	N	escarabajo	beetle	1.26
5	N	sombrero	hat	1.43
20	N	campanario	bell tower	1.43
2	N	reloj	clock	1.6
11	N	diamante	diamond	1.69
9	N	clavo	nail	1.71
6	N	burro	donkey	2
15	N	alfabeto	alphabet	2.46
4	N	ladrón	thief	2.63
22	N	estrofa	verse	2.69
26	V	emigrar	to emigrate	3.11
17	N	fábula	fable	3.17
10	V	juntar	to join	3.23
21	V	apostar	to bet	3.43
30	N	enmienda	emendation	3.74
29	V	omitir	to omit	3.77
16	V	aislar	to isolate	3.91
13	A	contagioso	contagious	3.97
19	V	prevenir	to prevent	4.03
24	N	espionaje	espionage	4.03
27	V	urgir	to urge	4.03
31	A	inminente	imminent	4.11
23	A	peligroso	dangerous	4.14
12	N	estorbo	nuisance	4.34
32	A	dilatorio	dilatory	4.37
14	N	disparate	nonsense	4.51
8	A	valiente	brave	4.57
25	N	rivalidad	rivalry	4.6
28	N	aflicción	affliction	4.6

The results presented in this study allowed us to validate the evaluation of the level of abstraction of the words included in our definition task as well as to define the independent variable *level of abstraction of the definiendum*. The mean values on level of abstraction per word of our instrument obtained from this study and presented in Table 1, allowed us to take this variable as a continuous variable for the subsequent analysis on the syntactic and semantic dimensions of word definitions.

2.4.5 Coding criteria

A total number of 4.448 definitions were gathered and their syntactic structure and semantic content was independently analysed. As a result, each definition was coded according to four dimensions: a syntactic dimension, relative to its structure, and three semantic dimensions: *use of the categorical term*, *specificity of the hyperonym* and the *semantic content of the definiens*. The four dimensions were defined according to the following criteria.

2.4.5.1 Syntactic Dimension

Firstly, we classified all the definiens produced by the children according to the syntactic complexity of the structure they used in their definiens. We elaborated our syntactic complexity scale according to the following criteria: *grammatical category* (*determiner*, *noun*, *adjective*, *verb*, *adverb*, *preposition*); presence of *modifiers*; *finiteness* (*finite* vs. *non-finite* verbs); *mode* (*infinitive* vs. *subjunctive*); *nominal subordination* (*relative clauses*); presence of *antecedent*; *explicitness* of the main *predicate* (*pre-sentence* structures vs. *sentences*); obligatory *nature* of *constructions* (*argument position* vs. *attributive function*); type of *construction* (*phrase*, *simple*

sentences, *complex sentences*); *verbal subordination*; and *syntactic function* (*subject*, *object*, *oblique*).

Based on these criteria, we built a syntactic complexity scale with 27 levels of complexity, in which each level of complexity corresponds to a determined syntactic structure. In the lower level of the scale we included structures which consist solely on a noun. The following levels of the scale consist on structures of increasing syntactic complexity up to the highest level, which consists on a relative clause.

We always coded one definition per word, and in those cases in which children provided two definiens for the same definiendum, if they were placed in different levels of complexity of the scale, we only coded the answer placed on the higher level of the syntactic complexity scale. This scale served us to reflect all the variability of answers that the corpus presented regarding the syntactic complexity of the structures that children used to elaborate each one of the definiens. We present a detailed explanation for each one of the 27 structures that integrate the scale of syntactic complexity in Appendix A.

2.4.5.1.1 Validation of the scale

The syntactic complexity scale was validated by two expert external judges independently. Two linguists got examples of each level of the scale presented randomly with the following instruction: <<*Ordenad estas definiciones en un orden creciente de complejidad sintáctica*, *cada cual según lo que entienda por complejidad sintáctica*. *Si consideráis que alguna estructura iguala en complejidad sintáctica a otra*, *colocadlas juntas*>>, "please, order these definitions in a crescent syntactic complexity order, according to what you understand by syntactic complexity. If you consider that

one structure equals another one in syntactic complexity, please, put them together". The judges did not receive any indication regarding syntactic complexity criteria.

Table 2

Pearson's Correlation between Theoretical Order and Judges' Order for Syntactic Complexity of the Structures in the Scale

Orders	Judge 1	Judge 2
Researcher	.887**	.914**
Judge 1		.982**

*p <.05 ** p <.01 *** p <.001.

We found a significantly high correlation between the scale built by the researcher and the order of complexity suggested by the two judges (r = .89, p < .01; r = .91, p < .01) and we also found a significantly high correlation between the two judges (r = .98, p < .01). Results from Table 2 support the ordinal classification of the syntactic complexity scale built by the researcher.

2.4.5.1.2 Syntactic complexity scale

The original scale (see Appendix A for a detailed explanation) contained 27 different levels of syntactic complexity. For statistical reasons, we decided to reduce those categories to five different levels that could better reflect, in an ordinal scale, the syntactic complexity of the definiens produced by the children. We built these five new levels according to the following criteria: lack of *explicitness* of the main *predicate* (*pre-sentence structures*); lack of *subordination* (*simple sentence*); presence of *verbal subordination* (*complex sentence*); and *nominal subordination* (*relative clauses*). The final scale of syntactic complexity contained the following levels and structures:

1) No answer

Answers consisting on a *frame* or a *don't know* assertion.

2) Pre-sentence structures

Definitions consisting on one of the following structures:

2.1 Noun

2.2 Prepositional phrase

2.3 Adjective phrase

2.4 Determiner phrase without modifiers

2.5 Noun phrase with modifiers

2.6 Determiner phrase with modifiers

2.7 Non-finite verb

2.8 Finite verb

2.9 Final adverbial phrases

2.9.1 Infinitive final adverbial phrase

2.9.2 Subjunctive final adverbial phrase

2.9.3 Final adverbial phrase with a finite verb form

2.10 Quasi-relatives

2.10.1 DP + preposition + infinitive verb form

2.10.2 DP + preposition + que +subjunctive verb form

2.11 Relative phrase without antecedent

3) Simple sentence

Definitions consisting on one of the following structures:

3.1 Non-finite simple sentence

3.2 Finite simple sentence

3.3 Non-finite copulative sentence

3.4 Finite copulative sentence

4) Complex sentence

Definitions consisting on one of the following structures:

4.1 Main predicate + final adverbial subordinated sentence

4.2 Adverbial subordinate sentence of time

4.3 Conditional and/or comparative sentence

4.4 Completive subordinate sentence with infinitive

4.5 Complex sentence with subordinate relative clause

4.6 Completive sentence with a finite verb which main predicate does not appear explicit introduced by the nexus of subordination *que*.

5) Relative clause

Definitions consisting on one of the following structures:

5.1 Free oblique/complement relative clause

5.2 Free subject relative clause

5.3 Semi-free subject relative clause

5.4 Semi-free object relative clause

5.5 Subject relative clause

5.6 Object relative clause

5.7 Complement/oblique relative clause

This scale with five different ordinal levels of syntactic complexity was used for every subsequent analysis regarding the syntactic dimension of the definition and the syntactic-semantic dimension.

According to what has been defined by researchers as the formal or canonical structure of a definition 'an X is a Y that Z', in this section we have explained the syntactic possibilities that this formal structure could take. In the following section we will present three different ordinal scales to analyse the three semantic sub-dimensions of this formal structure. Firstly, we will present the analysis of the categorical term (position Y) and then, the analysis for the different possibilities to express the semantic content of the definiens in the position Z of the formal structure.

2.4.5.2 Semantic Dimension.

In this section, we present the categories used for the analysis of the three semantic sub-dimensions of the definition: (1) *use of the categorical term*; (2) *specificity of the hyperonym*; and (3) *semantic content of the definiens*. A preliminary analysis of the content of the definitions revealed two different types of categorical terms: *hyperonyms* and *relational terms*.

2.4.5.2.1 Categorical Term

Hyperonym

We considered as hyperonym every answer consisting of a term or phrase more general than the definiendum but that at the same time could include the semantic category denoted by the definiendum. This broad definition for the ordinal category *hyperonym* allowed us to evaluate the use of hyperonyms in words of any morphological category. However, in order for a general term to be considered as hyperonimic there must be an *ontological adequacy* among the definiendum and the term supposedly hyperonimic (example 1). The noun *cosa* 'thing' and the pronouns *algo*, *alguien*, *alguno*, *uno*, 'something', 'somebody', 'someone', 'one' were considered as hyperonyms for nouns provided that they met the ontological adequacy criterion (example 2). The definite and indefinite articles and the universal quantifiers functioning as antecedents in semi-free relative clauses, were not considered as hyperonyms. It is important to highlight that it is not necessary that the hyperonimic term and the definiendum belong to the same morphological category (examples 3 and 4).

(1) R: *¿Qué es un paraguas*? 'what is an umbrela?'

CH: *Un utensilio que te tapa de la lluvia* 'a utensil that covers you from the rain'

(80, 7, H)

In the example (1) the taxonomic relationship is established between the definiendum *paraguas* 'umbrela' and the hyperonym *utensilio* 'utensil'. The term *utensil* meets the four requisites: (1) it is more general than the definiendum; (2) includes the category denoted by the definiendum; (3) it is semantically related to the definiendum; and (4) it is ontologically adequate.

(2) R: ¿*Qué es un diamante*? 'what is a diamond?'

CH: *Una cosa brillante*. 'a shiny thing'

(70, 7, H)

(3) R: ¿*Qué es espionaje*? 'what is espionage?'

CH: *Ver sin que se den cuenta*. 'to see without them noticing'.

(99, 7, M)

(4) R: ¿*Qué es valiente*? 'what is brave?'

CH: *Es una forma de decir que tienes mucha valentía*. 'it is a way to say that you have a lot of courage'

(95, 7, H)

In both examples (3 and 4) the *definiendums espionaje* 'espionage' and *valiente* 'brave' establish a taxonomic relationship with the hyperonyms *ver* 'to see' and *una forma de decir* 'a way to say', respectively. In both examples, the hyperonimic terms do not belong to the same morphological category of their definiendums; however, they meet the four requisites: (1) they are more general than the definiendum; (2) they include the category denoted by the definiendum; (3) they are semantically related to the definiendum; and (4) they are ontologically adequate, and therefore, we coded them as hyperonyms.

Relational Term

We considered as relational term every answer consisting of a term or phrase presenting a semantic connection with the definiendum. This term could be an *entity* (example 5 and 7), a *situation* (example 8) or a *characteristic* (example 6) susceptible to be applied to or related to the definiendum. It is important to highlight that relational terms do not necessarily belong to the same morphological category of the definiendum (examples 5 and 8). Nonetheless, in order for a term to be considered as relational, there must be an ontological adequacy among the definiendum and the term supposedly relational (5, 6, 7 and 8). Furthermore, the definiendum and the relational term establish a syntagmatic relationship, consequently, the definiendum could be substituted by the relational term, but the latter cannot include the semantic category denoted by the definiendum. Cases for which the participants provided a *synonym* (6) or a *semantically related term* (7 and 8), were also considered as relational terms.

(5) R: ¿*Qué es valiente*? 'what is brave?'

CH: *Es un guerrero* 'he's a warrior'

(128, 7, H)

(6) R: ¿*Qué es un alfabeto*? 'what is an alphabet?'

CH: *El abecedario*. *Son todas las letras que escribimos de la A a la Z y tiene todas las letras que se pueden escribir en oraciones*. 'the ABCs. Are all the letters that we write from A to Z and it has all the letters that can be written in sentences'

(77, 7, M)

(7) R: ¿*Qué es un burro*? 'what is a donkey?'

CH: *Es como un caballo solo que en miniatura que servía*, *como el caballo*, *para tirar de carros pero que no sean tan pesados*. 'it's like a horse but in miniature that served, as the horse, to pull chariots that were not that heavy'

(79, 7, H)

(8) R: ¿*Qué es contagioso*? 'what is contagious?'

CH: *Una enfermedad* 'an illness'

(59, 7, H)

In cases in which it was not possible to detect a term or construction that could be considered as a categorical term (9) or either the term used by the participant violated any of the conditions of ontological adequacy (10) or semantic relationship (11) were included in the category *ausencia de término categorial* 'absence of categorical term'.

(9) R: ¿*Qué es omitir*? 'what is to omit?'

CH: *Creo que es repetir*. 'I think it is repeating'

(136, 7, H)

(10) R: ¿*Qué es contagioso*? 'what is contagious?'

CH: *Un enfermo se lo contagia a otro*. 'one patient infects the other'

(7, 7, H)

(11) R: ¿*Qué es rivalidad*? 'what is rivalry?'

CH: *El rival que tienes y que dice que no tiene ningún rival por encima de él*. 'the rival you have who says that he has no rival above him'.

(65, 7, H)

The example 9 does not include a categorical term, because the child provides another term which shares a phonetic similarity with the definiendum. In the example 10, the clitic pronoun *lo* that substitutes the noun *enfermedad* 'illness', cannot function as a

categorical term of *contagioso* ‘contagious’. Finally, example 11 includes the tautological term *rival* ‘rival’ which cannot be considered as a categorical term because it violates the requisites of ontological adequacy and semantic relationship with the definiendum.

2.4.5.2.2 Specificity of the Hyperonym.

In every case in which the definition contained a hyperonym, we codified its specificity according to a scale of three ordinal levels following a criterion of increasing specificity, in which the hyperonym with the lowest level of specificity was included in the first level of the scale.

Low specificity

We considered as low specificity hyperonyms terms susceptible to be applied to multiple definiendums due to their level of generality. Even though these categorical terms have a broad level of generality, they must share an ontological adequacy with the definiendum: *una cosa*, *un tipo de*, *una especie de*, *algo*, *alguien*, *alguno* ‘a thing’, ‘a type of’, ‘a kind of’, ‘something’, ‘somebody’, ‘someone’, ‘one’.

(12) R: ¿Qué es un diamante? ‘what is a diamond?’

CH: Una cosa. ‘a thing’.

(130, 7, H)

Middle specificity

We considered as middle specificity hyperonyms terms that were not susceptible to be applied to multiple definiendums as their level of generality is semantically more restrictive that the one for hyperonyms with low specificity. However, these categorical terms are less specific than those of the following level of the scale. As in the case of hyperonyms in the first level of the scale, middle specificity hyperonyms must share an ontological adequacy with the definiendum.

(13) R: ¿Qué es un diamante? 'what is a diamond?'

CH: Una joya. 'a jewel'

(72, 7, M)

High specificity

We considered as high specificity hyperonyms terms which were more general than the definiendum but that at the same time could include the semantic category denoted by the definiendum. That is, terms that could not be applied to multiple definiendums, as their level of generality was low, compared to the hyperonyms in levels *one* and *two*, and which were semantically highly restricted. As in the case of hyperonyms in the previous levels of the scale, high specificity hyperonyms must share an ontological adequacy with the definiendum.

(14) R: ¿Qué es un cuchillo? 'what is a knife?'

CH: Un cubierto /instrumento/ objeto 'a piece of cutlery/instrument/object'

(85, 7, M)

2.4.5.2.3 Semantic Content of the definiens.

Our last semantic sub-dimension of analysis includes answers coded in a scale of five ordinal levels following an increasing definitional power criterion. In this section we will explain the classification and coding of the semantic content of the definiens expressed in the part Z of the formal structure.

Absence of Semantic Content

This category includes answers in which the child did not define the required word, but provided instead another word phonetically related to the definiendum (example 14).

(15) R: ¿*Qué es un disparate*? 'what is a nonsense?'

CH: *Una cosa que dispara* 'a thing that shoots'

(63, 7, M)

Deixis or Tautology

This category includes answers in which the child did not define the required word, but provided instead answers consisting on *gestures*, *actions* (15), the *repetition of the definiendum*, or a *derived term* (16).

(16) R: ¿*Qué es juntar*? 'what is to join?'

CH: *Es esto* (*junta las manos*) 'it's this (while he joins his hands)'

(47, 7, M)

(17) R: ¿*Qué es espionaje*? 'what is spionage?'

CH: *Espía* 'a spy'

(24, 7, H)

Contextual

This category includes answers in which the child provided a description of a plausible context of appearance of the definiendum or a situation related to the definiendum.

(18) R: ¿*Qué es contagioso*? 'what is contagious?'

CH: *Que*, *por ejemplo*, *estás malo, vas al colegio o al alguna actividad y se lo pegas* 'that, for example, you are sick, you go to school or to some activity and you give it (to somebody)'

(17, 7, M)

(19) R: ¿*Qué es un estorbo*? 'what is a nuisance?'

CH: *Que*, *por ejemplo*, *estamos hablando muy alto y los demás están trabajando* 'that, for example, we are talking very loud and the others are working'

(18, 7, M)

Sindef (*Synonyms*, *Descriptive Characteristics, or Functional Features*)

This category includes answers in which the child provided a *synonym*, *descriptive characteristics*, or the *functional property* of the *definiendum*. Therefore, the semantic content of the definiens provided by the participant could be a synonym (19) or alternatively, a term that could be placed at the same level than the definiendum in its taxonomic categorization (20). Secondly, the semantic content of the definiens provided by the participant could be a description of the external characteristics or a property of the definiendum (21 and 22). Finally, the semantic content of the definiens provided by the participant could be the function fulfilled by the definiendum (23 and 24).

(20) R: ¿*Qué es un burro*? 'what is a donkey?'

CH: *Asno* 'ass'

(12, 7, M)

(21) R: ¿*Qué es juntar*? 'what is to join?'

CH: *Unir* 'put together'

(32, 7, M)

(22) R: ¿*Qué es un campanario*? 'what is a bell tower?'

CH: *Una iglesia con campanas* 'a church with bells'

(42, 7, M)

(23) R: ¿*Qué es un cuchillo*? 'what is a knife?'

CH: *El cuchillo tiene hoja para cortar* 'the knife has blade to cut'

(52, 7, M)

(24) R: ¿*Qué es un sombrero*? 'what is a hat?'

CH: *Para ponértelo cuando hace calor* 'to put it when it's hot'

(49, 7, M)

(25) R: *¿Qué es un paraguas*? ‘what is an umbrella?’

CH: *Es para que no nos mojemos* ‘so we wouldn’t get wet’

(6, 7, H)

Definitional Features

This category includes answers in which the child provided a specific difference associated with the definiendum that could not be shared by other co-hyponyms under the same taxonomical category of the definiendum.

(26) R: *¿Qué es un paraguas*? ‘what is an umbrela?’

CH: *Un objeto para que te proteja de la lluvia y que no te caigan las gotas en la cabeza* ‘an object to protect you from the rain and that the drops wouldn’t fall onto your head’

(12, 7, H)

(27) R: *¿Qué es un reloj*? ‘what is a clock?’

CH: *Un aparato para ver qué hora es* ‘an apparatus to see what time it is’

(15, 7, M)

2.5 Strategy of Analysis

To detect the sources of variances in word definition we analysed word definitions in a multi-level model. In this model, the ordinal level of each definition in each of the dimensions on which participants' performance was measured was explained by the distance from the *mean* (*var*) (level one); and by the student's age and community (*level-two* students), the morphological category and the level of abstraction of the definiendum (*level-two* words).

According to this multi-level model, the latent variable *word definition performance* was evaluated on two major dimensions: syntactic and semantic, where the semantic dimension was evaluated in three sub-dimensions: categorical term, specificity of the hyperonym and semantic content of the definiens. Each of these dimensions was measured with different ordinal scales detailed in Table 3. Note that in the case of the syntactic complexity we are using the reduced scale.

Table 3

Ordinal Scales for Syntactic Dimension and Semantic Sub-Dimensions

Level	Syntactic Complexity	Categorical Term	Specificity of the Hyperonym	Semantic Content
0	No answer	No answer	No answer	No answer
1	Pre-sentence structures	Absence of categorical term	Absence of hyperonym	Absence of semantic content
2	Simple sentence	Relational term	Low specificity	Deixis & tautology
3	Complex Sentence	Hyperonym	Middle specificity	Contextual
4	Relative clause		High specificity	Sindef
5				Definitional features

We evaluated the syntactic and semantic dimensions in two levels, where level one is a definition of a word in an ordinal scale. For level 1, we constructed the *variance* (*var*) within each student and for each word definition, based on the distance of the specific category of definition from the ordinal scale to the mean of the morphological category (i.e. nouns, adjectives, and verbs) performed by the student on each dimension (syntactic and semantic). In other words, the within mean of the student's definition by morphological category was the centre around which we measured the student's performance. Considering i as an index of students, i=1,2,…,139 and j as the number of words in a dimension (syntactic complexity, categorical term, specificity of the hyperonym, and semantic content of the definiens), the following equation explains the construction of the variable: $Var_{ij}=| score_{ij}-(1/j)\Sigma_j score_{ij} |$, for all i-s. The variable *var*, therefore, was calculated for each student separately, around the student's mean score within that dimension for every word, within each morphological category (noun, adjective, and verb). Altogether, each student had 128 new scores for the variable *var*.

While the more intuitive central moment is the *mode*, due to the high level of *zeroes* in our sample (*don't know* answers) this score could almost repeat the original scale, and therefore, we selected the *mean* over the *mode* to generate a true *variance*. The variable *var* allowed us to define in which morphological category students performed more consistently. That is, we did not ask how the students performed with respect to the *grand mean*, but with respect to their own *mean performance* in each of the morphological categories.

On level two we included the independent variables: The students (the variation between student's age, and the community of origin of the students), and the score of each word in terms of the morphological category and the level of abstraction of the definiendum. The uniqueness of this model is that it considers two different level-two

variables, that is, the variables that vary between students (age and community), and the variables that vary between words (morphological category and level of abstraction of the definiendum). Note that while in one-level regression models each observation provides the full information for the total variation, in multi-level regression models all levels explain the variance.

In our multi-level model, we explained each student's word definition by the level-one distance from the mean and the level-two: student's age, community, morphological category and level of abstraction of the definiendum. Different analyses were used in our multi-level model:

(1) We used a binary model and performed a Multilevel Binary Logistic Regression analysis with a transformation of the syntactic complexity ordinal scale into a binary one to test preliminary hypothesis on the division between *don't know* and *know* answers. We tested the effect of the IVs *age* and *community*, at student level in level two, and the effect of the *morphological category* and the *level of abstraction of the definiendum* at the word level in level two, on the probability of the participants not providing a definiens (i.e., answering *don't know*).

(2) We used a hierarchical linear model and performed a Multilevel Regression analysis to test the effect of the IVs *age* and *community*, at student level in level two, and the effect of the morphological category and the level of abstraction of the definiendum at the word level in level two, on the variance of the syntactic structures of nouns, adjectives and verbs definiens.

(3) We used a multilevel ordered logit model and performed a Multilevel Ordinal Logistic Regression analysis to estimate the effect of the IVs age and community, at student level in level two, and the effect of the morphological

category and the level of abstraction of the definiendum at the word level in level two, on the level of syntactic complexity of the structure of the definition, and the semantic complexity of the categorical term, the specificity of the hyperonym, and the semantic content of the definiens. That the model is ordered means that the probability of being in a higher category is cumulative with respect to the probability of being in a lower category.

(4) We calculated the predicted cumulative probabilities for the ordered categories for every Multilevel Ordinal Logistic Regression analysis, that is, we calculated the probabilities of being in each level of the ordinal scale of the syntactic and semantic dimensions.

(5) Finally, we calculated the *cumulative probabilities* for the syntactic complexity ordinal scale and for each one of the semantic sub-dimensions in order to show how different characteristics of students and words represented different probabilities to be on a specific category in the syntactic and semantic dimension ordinal scales, and how the cumulative probability varied across different students and words.

This strategy of analysis is based on the methodology suggested by Baayen et al. (2008), where they emphasized the need for a multi-level analysis in cases of language performance measurements. They suggested the Mixed-effect Modelling with Crossed Random Effects for subjects and items. In our research, subjects are students and words and items are each word definition. That is, the number of items is the number of students multiplied by the number of words defined (i.e. 20 nouns, 5 adjectives, and 7 verbs). In the case of bilingual communities, our data included only eight students. This is a relatively small sub-sample and may not be sufficiently representative of such communities. However, our purpose was to dummy out potentially extreme values obtained in relation to these students. Therefore, we included the community of the students as another independent variable and, by controlling for this variable, we were able to ensure that the effect of extreme values, primarily derived from bilingual students, did not affect the significance level of the original explanatory variables.

The first part of the results concerns the preliminary analysis of the *don't know* and *know* answers and the syntactic dimension of word definitions (regarding syntactic complexity). We ran a dummy dependent variable to distinguish between *full answers* and *don't know* answers, which account for around 40% of the cases. And we evaluated the syntactic complexity of the structure of the definiens for each word by level-one distance from the mean (*var*) and level-two observations: students (age and community) and words (morphological category and level of abstraction of the definiendum).

The second part of the analysis concerns the semantic dimension of the latent variable *word definition performance*. As in the analysis performed for the first dimension, we explained the semantic categories of analysis for each sub-dimension (categorical term; specificity of the hyperonym; and semantic content of the definiens) to evaluate

semantic complexity for each word by level-one distance from the mean (*var*) and level-two observations regarding students and words.

Finally, we included in one model both syntactic and semantic dimensions to test the correlation between the two parts of the analysis. In this final model we used the semantic categories as the dependent variables and regressed them against the syntactic categories as level-one variable, and against the student's age and the level of abstraction as level-two variables. Here we also controlled by the morphological category of the word (i.e., noun, adjective and verb). Note that this control was measured by the variance (*var*), and enabled us not only to define variance within a student, but also to define variance within a student between the different morphological categories.

The advantage of this design is threefold. First, it allowed us to define the cumulative probability of each student definition to be on a specific syntactic or semantic structure level. Second, these probabilities can be aggregated by student (regarding age), by morphological category or by level of abstraction of the definiendum. We can use these probabilities to define average levels for a student, student age, morphological category, etc. Third, this model maximizes the use of information collected by the researcher. In other words, the individual level –a word definition by a student–, is the core piece of information. Models that aggregate the performance of a student across all defined words lose the variation of *word definition performance* within each student. However, with the multi-level model we can both evaluate the role of the variation of the words and the role of the variation of the students.

2.6 Results

2.6.1 Difficulty of the words in the instrument

In order to investigate the relationship between the difficulty of the words according to the order in which they appear listed in the task and the real difficulty to define them, we obtained the order of frequency of the *don't know* answers for each word and we correlated it with the order of difficulty of the word in our instrument. The difficulty of the word in the instrument is significantly highly related with the empiric difficulty to define it ($r = .949$, $p < .10$). The higher the difficulty of the word in the instrument the higher the difficulty to define that word, because children answer *don't know* to the question *¿Qué es un x?* 'what is an X?' more frequently than they provide a definition for the required definiendum.

From the 32 words we asked the participants to define, almost half of the time their answers were not a definition of the word, that is, children answered *don't know* to the researcher question *¿Qué es un X*? (31.6%, 48.8%, and 66.2%, for nouns, adjectives, and verbs, respectively) and in very few cases they provided little texts (frames) as an answer (0.9%, 1.2%, and 1.3%, for nouns, adjectives, and verbs, respectively).

2.6.2 Analysis of the no answer

We ran a Multilevel Binary Logistic Regression model to evaluate the probability of the students not defining a word, that is, answering *don't know* to the question "what is x?". The dependent variable for this analysis was a transformation of the syntactic complexity ordinal scale, with five levels of syntactic complexity, into a binary one. This transformation left us with two options for this model: *don't know* and all other answers (*know*). We wanted to evaluate the probability of not answering the question "what is x?" with a definition vs. the probability of answering it with a definition. The independent variables were measured in two different levels inside the level-two variation: The age (*younger* vs. *older children*) and the community (*bilingual* vs. *monolingual*), which varied by students; and the morphological category (*noun*, *adjective* and *verb*) and the level of abstraction of the definiendum (*low* vs. *high*), which varied by word. We also tested the possible effect of interactions of the variables age and morphological category and level of abstraction and morphological category. The methodology for this analysis (and for the rest of the analysis for the syntactic and semantic dimensions separately) required that we compared an *unconditional* model (model 1) to a model that tested the effect of the morphological category (model 2); to a third model that tested the main effect of the independent variables (model 3); and lastly to a model with interactions (model 4). Table 4 below presents the estimates for the different models and the components of the explained variance between the levels.

Table 4

Multilevel Binary Logistic Regression. Testing Word Definition Success

		Model 1	Model 2	Model 3	Model 4
Fixed effects	Intercept	-1.19 (0.61)	-2.26** (0.70)	-1.67* (0.84)	-1.67* (0.84)
L2: Student level	Age			-0.08 (0.04)	-0.08 (0.04)
	Community			0.34 (0.63)	0.34 (0.63)
L2: Word level	Adjectives vs. Nouns		2.16 (1.53)	-1.01 (1.37)	3.16 (5.91)
	Verbs vs. Nouns		3.34* (1.34)	1.30 (1.13)	1.03 (1.79)
	Abstract			1.94*** (0.43)	1.95*** (0.43)
Students by Word Interaction	Age X Adj vs. N				-0.001 (0.04)
	Age X Verbs vs. N				0.001 (0.03)
	Abstract X Adj vs. N				-3.60 (4.99)
	Abstract X Verbs vs. N				0.44 (2.53)
Variance components					
Level 2 - students	Student intercept $\sigma_{student}^2$	2.68*** (1.64)	2.68*** (1.64)	2.59*** (1.61)	2.59*** (1.61)
Level 2 - words	Word intercept σ_{word}^2	11.15*** (3.34)	9.16*** (3.03)	5.54*** (2.35)	5.54*** (2.35)
ICC students		.16	.18	.23	.23
ICC words		.65	.61	.48	.48
Pseudo R^2			.12	.33	.33

Note. Values enclosed in parentheses represent standard errors (for fixed effects) and standard deviation (for random parameters).
*p<.05 **p<.01 ***p<.001.

The unconditional model (model 1) provided the sources of variation for the crossed level-two variables, students and words, regardless of any potential explanatory variable. We found that word level provided 65% of the variation, while the student level added 16% of the variation, which indicated that mainly the characteristics of the word, that is, the morphological category and the level of abstraction of the definiendum, were more important than the characteristics of the students in explaining word definition.

Model 2 tested the effect of the morphological category of the definiendum on the probability of answering *don't know* to the question "what is x?". We expected adjectives and verbs to be associated with higher probabilities of *don't know* answers. When verbs were compared against nouns, the probability not to know the word increased significantly ($b=3.34$, $p<.05$). Therefore, there was a negative effect on the probability to be in the *know* category for verbs. In other words, the probability to have *don't know* answers, was higher for verbs compared to nouns.

Model 3 tested the effect of the independent variables regarding the students' characteristics (age and community) and the complexity of the word (morphological category and level of abstraction of the definiendum). Table 3 showed that at the student level, neither the age of the children nor the community made a significant difference.

Regarding word level, results showed that the higher the level of abstraction of the definiendum the higher the probability of answering *don't know* to the question "what is x?" ($b=1.94$, $p<.001$). When the morphological category was paired with the level of abstraction of the definiendum, we lost the effect of the morphological category, maybe because probable multicollinearity[6] of the level of abstraction and the morphological

[6] Multicollinearity does not bias the results, but could produce large standard errors in the related independent variables.

category reduced the effect of the latter. Once again, the percentage of variance explained by the word level was much higher in comparison with the percentage of variance explained by the subject level (48% and 23% for words and subjects, respectively), yet the total variance explained was higher (pseudoR^2= 33%) due to additional predictors at level one.

Model 4 did not show any significant interaction between the age and the complexity of the word and the original distribution across the different categories was similar.

To illustrate the propensity not to know how to define a word we calculated probabilities based on the results shown in table 4 for an average student. Since all variables are either *dummy* variables or centred around their grand mean, the value *zero* on all the explanatory variables represents the average student, that is, a child with a mean age who belongs to a monolingual community and who provides a noun definition for a definiendum with a medium level of abstraction.

For example, the probability not to know a *noun* was calculated as follows:

exp(-1.67)/(1+exp(-1.67))=15.8%. Following the same function, the probability of not defining an adjective was 6.4%, and the probability of not defining a verb was 40.9%. We also calculated those probabilities for high and low levels of abstraction (1 standard deviation above and below the zero mean, respectively). The probability of not defining a noun with a low level of abstraction was 1.7%, an adjective was 0.6% and a verb was 5.9%; while the probabilities for words with a high level of abstraction were 67.2%, 42.7%, and 88.3%, for nouns, adjectives and verbs, respectively. This illustrated the effect of the level of abstraction of the definiendum on the inability to define a word. Contrary to what we expected, it was the adjective the one with the lowest percentage of *don't know* answers, but the verb, as expected, obtained the highest percentage of *don't know* answers. These results show that an increase in the level of abstraction of the

definiendum increases dramatically the percentage of *don't know* answers for the three morphological categories. Out of the three morphological categories in our study, the verb seems to be the morphological category upon which the level of abstraction of the definiendum has the greatest effect, followed by the noun and the adjective.

2.6.3 Analysis of the Variance for the Syntactic Dimension

We ran a Multilevel Regression Model to test the variance of the syntactic structures of noun, verb and adjective definitions in a hierarchical linear model. The dependent variable was the student's mean variance (*var*), taken as a continuous variable (the within mean of each student's word definition by morphological category). The independent variables were measured in two different levels inside level two: the age (younger vs. older children) and the community (bilingual vs. monolingual), which varied by students; and the morphological category (noun, adjective, and verb) and the level of abstraction of the definiendum (low vs. high), which varied by word. We also tested the possible effect of interactions of the variables age and morphological category; and level of abstraction and morphological category. As in the analysis of the *no answer*, the methodology for this analysis required that we compared an unconditional model (model 1) to a model that tested the effect of the morphological category (model 2); to a third one that tested the main effect of the independent variables (model 3); and, lastly, to a model with interactions (model 4). Table 5 presents the estimates for the different models and the components of the explained variance between the levels.

Table 5

Multilevel Regression. Testing Students' Mean Variance on the Syntactic Dimension

		Model 1	Model 2	Model 3	Model 4
Fixed effects	Intercept	1.89***	1.98***	1.99***	2.00***
		(0.08)	(0.09)	(0.19)	(0.18)
L2: Student level	Age			0.02	0.02
				(0.01)	(0.01)
	Community			0.07	0.07
				(0.17)	(0.17)
L2: Word level	Adjectives vs. Nouns		0.16	-0.10	0.21
			(0.18)	(0.19)	(0.75)
	Verbs vs. Nouns		-0.52**	-0.68***	-0.27
			(0.16)	(0.15)	(0.23)
	Abstract			0.15*	0.18**
				(0.06)	(0.05)
Students by Word Interaction	Age X Adj vs. N				0.01
					(0.01)
	Age X Verbs vs. N				0.01
					(0.01)
	Abstract X Adj vs. N				-0.30
					(0.63)
	Abstract X Verbs vs. N				-0.76
					(0.32)
Variance components					
Level 1		1.06	1.06	1.06	1.06
		(1.03)	(1.03)	(1.03)	(1.03)
Level 2 - students	Student intercept $\sigma_{student}^2$	0.20***	0.20***	0.19***	0.19***
		(0.44)	(0.44)	(0.44)	(0.44)
Level 2 - words	Word intercept σ_{word}^2	0.18***	0.12***	0.10***	0.08***
		(0.42)	(0.35)	(0.31)	(0.29)
ICC students		.14	.14	.10	.10
ICC words		.12	.07	.43	.43
Pseudo R^2			.06	.02	.02

Note. Values enclosed in parentheses represent standard errors (for fixed effects) and standard deviation (for random parameters).
*p<.05 **p<.01 ***p<.001.

The unconditional model provided the percentage of variance explained by the crossed level-two effects –students and words–, regardless of any potential explanatory variable. Table 5 showed that the intra-class correlation (ICC), which measures the sources of variation at the higher-level variables (level-two variables), was 14% for the student level and 12% for the word level. The percentages of variance explained decreased for the student level (14%, and 10%, for model 2 and 3, respectively) but increased for the word level (7%, and 43%, for model 2 and 3, respectively), These percentages of variance explained are fairly significant and lent support to the premise about the within-word and within-student effect, that is, that mainly the characteristics of the word (i.e., morphological category and level of abstraction of the definiendum) are more important than the characteristics of the participants (i.e., age) to explain children's word definitions.

The second model measured the effect of the morphological category of the definiendum in the variance of the syntactic structures. Table 5 showed that the average value of the variance for the morphological category *verb* ($b=-0.52$, $p<.01$) was lower than it was for nouns. Therefore, verbs presented less variation than nouns, probably due to the higher percentage of *don't know* answers for verbs compared to nouns.

Model 3 measured the effect of all the independent variables. Results for table 5 showed no significant difference at the student level. At the word level, the higher the level of abstraction of the definiendum, the higher the value for this variance ($b=0.15$, $p<.05$), which means that the variance was higher for words with a high level of abstraction. Probably because words with higher abstraction levels prompted a higher percentage of answers in the lowest categories of response of the different scales for both syntactic and semantic dimensions, and the answers tended not to concentrate on one single category of response. When the morphological category was paired with the level of

abstraction of the definiendum, we found that the average value of the variance for verbs was lower than it was for nouns ($b=-0.68$, $p<.001$). Therefore, verbs presented less variation than nouns, probably due to the higher percentage of *don't know* answers for verbs, as seen in table 4.

The fourth model, did not show any significant interaction between the age and the complexity of the word and the original distribution across the different categories was similar.

Overall, these results together with the ones for the *don't know* vs. *know* answers, made the case for further probability analysis that will be shown in the next sections.

2.6.4 Syntactic Dimension

2.6.4.1 Syntactic Complexity Ordinal Scale

We ran an Ordered Logit Model to evaluate the performance of the children on the syntactic complexity of the of the *definiens'* structure. This analysis allowed us to estimate the probability of the definiens to be in one of the following categories of the syntactic complexity ordinal scale: pre-sentence structures, simple sentence, complex sentence, and a relative clause. The dependent variable was the complexity of the syntactic structure the children used in their definitions, measured with the reduced ordinal scale presented above. The independent variables were measured in two levels: the variance at level 1, which varied at the individual level (Student x Word); and at level two the age and the community, which varied by students; and the morphological category and the level of abstraction of the definiendum, which varied by word. We also tested the possible effect of interactions of the variables age and morphological category; and level of abstraction and morphological category. The methodology for this analysis required the same procedure followed in the *no answer* and the *variance*

analyses. Table 6 shows regression estimates for all cases of the syntax complexity scale excluding the *don't know* cases. We also performed multilevel ordinal logistic regression analyses for the syntactic and semantic dimensions including the *no answer* in the respective scales. However, given the number of cases of *don't know* answers in children, we decided to perform the multilevel regression analyses excluding the *don't know* cases in order to avoid the chances that a dominant category of *don't know* (29%) could bias the estimation. These analyses, excluding the *don't know* cases, would be the ones presented in this section of the syntactic dimension and in the subsequent sections regarding sub-dimensions of the semantic dimension of the definition. See table B.1 in Appendix B for the full array of responses, including the *no answer*, across the four different models.

Table 6

Multilevel Ordinal Logistic Regression. Four Stage Analysis with Fixed and Random Effects Predicting the Probability of the Complexity of the Syntactic Structure of the Definiens

		Model 1	Model 2	Model 3	Model 4
Fixed effects	Intercept	-0.28 (0.15)	-0.21 (0.17)	-0.33 (0.61)	-0.32 (0.58)
	Thold 2	0.46*** (0.03)	0.46*** (0.03)	0.99*** (0.06)	0.98*** (0.06)
	Thold 3	1.33*** (0.05)	1.33*** (0.05)	2.98*** (0.11)	2.97*** (0.11)
L1: Student *word	Student mean variance			-2.33*** (0.07)	-2.32*** (0.07)
L2: Student level	Age			-0.07 (0.04)	-0.07 (0.04)
	Community			-0.63 (0.61)	-0.64 (0.58)
L2: Word level	Adjectives vs. Nouns		-0.32 (0.32)	0.35 (0.37)	0.73 (1.30)
	Verbs vs. Nouns		-0.15 (0.28)	1.08** (0.31)	1.72*** (0.45)
	Abstract			-0.14 (0.11)	-0.11 (0.10)
Students by Word Interaction	Age X Adj vs. N				-0.01 (0.04)
	Age X Verbs vs. N				-0.01 (0.05)
	Abstract X Adj vs. N				-0.39 (1.09)
	Abstract X Verbs vs. N				-1.14 (0.68)
Variance components					
Level 2 - students	Student intercept $\sigma_{student}^2$	1.42*** (1.19)	1.42*** (1.19)	2.37*** (1.54)	2.26*** (1.50)
Level 2 - words	Word intercept σ_{word}^2	0.32*** (0.56)	0.29*** (0.54)	0.25*** (0.50)	0.19*** (0.44)
ICC students		.28	.28	.40	.39
ICC words		.06	.06	.04	.03
Pseudo R^2			.01	-.17	-.14

Note. Values enclosed in parentheses represent standard errors (for fixed effects) and standard deviation (for random parameters).
*p<.05 **p<.01 ***p<.001.

The unconditional model tested the threshold for the different categories and allowed us to know the percentage of variance explained by the crossed level-two effects (students and words). Table 6 showed that regardless of any potential explanatory variable the student level (ICC students) explained 28% of the variance while the word level (ICC words) explained 6% of the variance.

Model 2 measured the effect of the morphological category of the definiendum on the dependent variable *complexity of the syntactic structure of the definiens*. As shown in table 6, there was no effect of the IV morphological category of the definiendum on its own.

Results for the main effect model (model 3) showed several interesting effects. When the distance of the student's score on each word (L1: student mean variance) with respect to the student's mean ($b=-2.33$, $p<.001$) increased, the probability of being in a higher ordered category also increased, and variability within a student meant that events of higher ordered categories were frequent compared to the *no answer*. That the probability is higher is due to the fact that children used a high number of different syntactic structures in their definiens, that is, the bulk of the answers belongs to a low category and an increase in the variability of the syntactic structure of children's definiens means that there is a higher probability that the definiens presents a structure of a higher level in the syntactic complexity scale.

At the student level, neither the age of the children nor the community made a significant difference.

Regarding word level, results showed that the level of abstraction of the definiendum did not affect the category of the syntactic complexity scale into which the student belonged. When the morphological category of the definiendum was paired with the level of abstraction of the word, the probability of being in a higher ordered category

was lower for verbs compared to nouns (b=1.08 p<.01). In other words, verbs were more difficult to define, regarding their syntactic structure, than nouns. Therefore, noun definitions had a higher probability to contain higher ordered categories for the syntactic structure than verb definitions. We could see that the percentage of variance explained by the subject level was higher in comparison with the percentage of variance explained by the words (40%; and 4%, for subjects and words, respectively).

The fourth model, did not show any significant interaction between the age and the complexity of the word (morphological category and level of abstraction), and the original distribution across the different categories was similar.

2.6.4.2 Cumulative Probabilities for Syntactic Complexity Ordinal Scale

To complete the analysis of the syntactic complexity of definitions we calculated the cumulative probability of the children's *definiens* being in a certain category level of the syntactic complexity ordinal scale without taking into account the *no answer*. These probabilities were calculated for different students, characterized by deviation from the mean, to show how different characteristics of students and words represented different probabilities of the children's *definiens* to be on a specific category in the syntactic complexity ordinal scale, and how the cumulative probability varied across different students and words. The probabilities for the *mean* are shown in the first column (noun) of table 7. Given that all continuous variables were centred around the mean, the probability for an average student was related to nouns (zero for adjectives and zero for verbs) The constant shift in these probabilities reflected the effect of the morphological category of the definiendum. The age effect was illustrated by the younger and older ages (one standard deviation below and above the *zero-mean*, respectively), and the effect of the level of abstraction was illustrated by the low level and the high level of

abstraction of the definiendum (one standard deviation below and above the *zero-mean*, respectively).

Table 7 presents these cumulative probabilities for the different morphological categories, the age of the students, and the level of abstraction of the definiendum. This table (and the rest of the cumulative probabilities tables) express cumulative probabilities and, as such, the percentages for each one of the levels of the syntactic complexity scale accumulate from one category to the next reaching the 100% at the highest level of the scale. However, in order to simplify the reading of these tables, we present the real mean percentages for each one of the levels of the syntactic complexity scale instead of presenting the cumulative percentage. We followed this same criterion in the presentation of the cumulative probability tables for the analysis of the semantic dimension of the definition.

Table 7

Predicted Cumulative Probabilities for the Ordered Categories of the Syntactic Complexity of the Definiens

		Morphological Category			Age		Abstraction	
MC	Scale Levels	Nouns	Adj	Verbs	Younger	Older	Low	High
Noun	Pre-sentence	42	50	68	48	36	38	46
	Simple Sentence	24	23	17	23	24	24	24
	Complex Sentence	27	22	13	24	32	30	25
	Relative Clause	7	5	2	5	8	8	5
Adj	Pre-sentence				57	44	46	55
	Simple Sentence				21	24	23	22
	Complex Sentence				18	26	25	19
	Relative Clause				4	6	6	4
Verb	Pre-sentence				73	62	64	71
	Simple Sentence				15	19	19	16
	Complex Sentence				10	16	14	11
	Relative Clause				2	3	3	2

Note. The values represent mean percentages for each level of the ordinal scale

Results from table 7 showed that the probability for an average student to answer the question “what is x?”, regarding syntactic complexity only, with the lowest category of answer in the scale was 42%. This means that pre-sentence structures, with a 42% probability, were the preferred structures for an average student to define a noun. In the case of adjectives, the cumulative probability of being in lower categories was a little higher than it was for nouns, but smaller in comparison with verbs. Pre-sentence structures (50%) were also the preferred structures for defining adjectives. In the case of verbs, the probability to be in the lower categories increased significantly, compared to adjectives and nouns, being also the pre-sentence structure the one with the higher percentage 68%. Therefore, verbs increased the probability for the lower categories. We found a linear morphology effect. So that adjectives presented higher probabilities for the lower ordered categories, while verbs presented even higher probabilities for the lower categories.

The variable age did not seem to affect the cumulative probability of the syntactic complexity of the children’s definiens. Table 7 showed that both younger (48%, 57%, and 73%, for nouns, adjectives, and verbs, respectively) and older children definitions (36%, 44%, and 62%, for nouns, adjectives, and verbs, respectively) had a very high probability of using a pre-sentence structure. But the probability for the older children to include a relative clause (8%; 6%; and 3%, for nouns, adjectives and verbs, respectively) was a little higher compared to the probability for younger children to use a relative clause (5%; 4%; and 2%, for nouns, adjectives and verbs, respectively) in their definitions.

Finally, the level of abstraction of the definiendum did not seem to affect the cumulative probability of the syntactic complexity of the children's definiens. When definiendums had a high level of abstraction the question "what is x?" was responded with pre-sentence structures (46%; 55%; and 71%, for nouns, adjectives and verbs, respectively), and the same remains true for definiendums with a low level of abstraction, for which the same question also prompted a pre-sentence structure (38%; 46%; and 64%, for nouns, adjectives and verbs, respectively).

These trends provided support to our findings in Table 6 which showed main effects of the morphological category of the definiendum in the syntactic complexity of the definiens' structure.

2.6.5 Semantic Dimension

2.6.5.1 Analysis of the Categorical Term of the Definiens

We ran an Ordered Logit Model to evaluate the performance of the participants on the production of a categorical term in the definiens. This analysis allowed us to estimate the probability of the definiens to be in one of the following categories of the categorical term ordinal scale: absence of categorical term, relational term, and hyperonym. The dependent variable was the categorical term the children used in their definitions, measured with the ordinal scale presented above. The independent variables were measured in two levels: the variance at level 1, which varied at the individual level; and at level 2 the age and the community, which varied by students; and the morphological category and the level of abstraction of the definiendum, which varied by word. We also tested the possible effect of interactions of the variables age and morphological category; and level of abstraction and morphological category. The methodology followed for this analysis –and for the rest of the analyses in the semantic dimension– was the same one followed for the previous analyses of the *no answer*, the *variance*, and the syntactic complexity of the *definiens*. Note that this analysis excludes the *don't know* cases. For the full array of responses, including the *no answer*, across the four different models, see table B.2 in Appendix B. Table 8 shows regression estimates for all cases of the categorical term scale across the four different models.

Table 8

Multilevel Ordinal Logistic Regression. Four Stage Analysis with Fixed and Random Effects Predicting the Probability of the Categorical Term of the Definiens

		Model 1	Model 2	Model 3	Model 4
Fixed effects	Intercept	0.54*	-0.02	-1.36**	-1.49**
		(0.25)	(0.25)	(0.43)	(0.50)
	Thold 2	0.94***	0.94***	2.73***	2.74***
		(0.04)	(0.04)	(0.14)	(0.14)
L1: Student *word	Student mean variance			-6.39***	-6.41***
				(0.22)	(0.22)
L2: Student level	Age			-0.10***	-0.13***
				(0.03)	(0.03)
	Community			1.32	1.34
				(0.40)	(0.40)
L2: Word level	Adjectives vs. Nouns		1.29*	0.56	0.56
			(0.55)	(0.53)	(1.92)
	Verbs vs. Nouns		1.70**	2.23***	3.20***
			(0.50)	(0.48)	(0.72)
	Abstract			0.54***	0.57***
				(0.15)	(0.14)
Students by Word Interaction	Age X Adj vs. N				0.08
					(0.05)
	Age X Verbs vs. N				0.07
					(0.08)
	Abstract X Adj vs. N				-0.06
					(1.61)
	Abstract X Verbs vs. N				-2.01
					(1.12)
Variance components					
Level 2 - students	Student intercept $\sigma_{student}^2$	1.45***	1.45***	0.61***	0.62***
		(1.20)	(1.20)	(0.78)	(0.79)
Level 2 - words	Word intercept σ_{word}^2	1.49***	0.97***	0.52***	0.45***
		(1.22)	(0.99)	(0.72)	(0.67)
ICC students		.23	.25	.14	.14
ICC words		.24	.17	.12	.10
Pseudo R^2			.08	.29	.30

Note. Values enclosed in parentheses represent standard errors (for fixed effects) and standard deviation (for random parameters).
*p<.05 **p<.01 ***p<.001.

Results for model 2 revealed that both adjectives and verbs were more difficult to define than nouns ($b=1.29$, $p<.05$; $b=1.70$, $p<.01$, for adjectives and verbs, respectively) therefore when the morphological category changed from noun to adjective or verb the probability of being in a higher ordered category of the categorical term was lower for adjectives and verbs.

Model 3 showed that when the distance of the student's score on each word with respect to the student's mean ($b=-6.39$, $p<.001$) increased, the probability of being in a higher ordered category also increased, and variability within a student means that events of higher categories were frequent in comparison with the use of absence of a categorical term.

At the student level we saw that the older the age of the children, the higher the probability to be in a higher ordered category ($b=-0.10$, $p<.001$) and coming from a monolingual or a bilingual community did not make a difference.

At the word level, results showed that the higher the level of abstraction of the words, the lower the category in the categorical term scale into which the student belonged ($b=0.54$, $p<.001$), that is, words with a higher level of abstraction showed cases of responses placed in the lower categories of the categorical term scale. When the morphological category was paired with the level of abstraction of the definiendum, the effect on adjectives was lost but the effect on verbs prevailed. The probability of being in a lower ordered category was higher for verbs compared to nouns ($b=2.23$ $p<.001$). In other words, verbs were more difficult to define regarding the use of a categorical term than nouns. Therefore, children's noun definitions had a higher probability to contain higher ordered categories for the categorical term than verb definitions.

We could see that the percentage of variance explained by the subject level was a little bit higher in comparison with the percentage of variance explained by the words (14%, and 12%, for subjects and words, respectively).

The fourth model, did not show any significant interaction between the age and the complexity of the word, and the original distribution across the different categories was similar.

2.6.5.1.1 Cumulative Probabilities

To complete the analysis of the categorical term in the definiens, we calculated the cumulative probability of children's definiens being in a certain category of the categorical term ordinal scale without taking into account the *no answer*. These probabilities were calculated for different students, characterized by deviation from the mean, to show how different characteristics of students and words represented different probabilities to be on a specific category level in the categorical term ordinal scale, and how the cumulative probability varied across different students and words. The probabilities for the mean are shown in the first column (noun) of Table 9. Because all continuous variables were centred around the mean, the probability for an average student was related to nouns (zero for adjectives and zero for verbs). The constant shift in these probabilities reflected the effect of the morphological category of the definiendum. The age effect was illustrated by the younger and older ages (one standard deviation below and above the *zero-mean*, respectively), and the effect of the level of abstraction was illustrated by the low level and the high level of abstraction of the definiendum (one standard deviation below and above the *zero-mean*, respectively). Table 9 presents these cumulative probabilities for the different morphological categories, the age of the students, and the level of abstraction of the definiendum.

Table 9

Predicted Cumulative Probabilities for the Ordered Categories of the Categorical Term of the Definiens

		Morphological Category			Age		Abstraction	
MC	Scale Levels	Nouns	Adj	Verbs	Younger	Older	Low	High
Noun	Absence of CT	20	31	70	27	15	12	33
	Relational Term	59	56	27	58	58	55	55
	Hyperonym	21	13	3	15	27	33	12
Adj	Absence of CT				39	24	19	46
	Relational Term				52	59	59	47
	Hyperonym				9	17	22	7
Verb	Absence of CT				77	62	55	82
	Relational Term				21	34	40	17
	Hyperonym				2	4	5	1

Note. The values represent mean percentages for each level of the ordinal scale

Results from table 9 showed that the cumulative probability for an average student to answer the question "what is x?" including a categorical term placed in the higher categories of the categorical term ordinal scale (relational term and hyperonym) was 80%; while the cumulative probability of a student definiens not including a categorical term was only 20%. This meant that the definition of an average student for a noun had a very high probability of including a categorical term, being the relational term the level in the scale with the higher percentage (59%). In the case of adjectives, the cumulative probability of being in higher categories was lower than it was for nouns, however, like in the case of nouns, definitions for adjectives had a very high probability of including a categorical term (69%), being the relational term the level in the scale with the higher percentage (56%). In the case of verbs, the probability of a student definiens not including a categorical term increased significantly compared to adjectives and nouns, being the absence of a categorical term, unlike in the case of nouns and adjectives, the one with the higher percentage 70%; therefore, verbs increased the probability for the lower categories as children definiens for verbs tended not to include a categorical term. We found a linear morphology effect, that is, adjectives and verbs presented lower probabilities for the higher ordered categories, compared to nouns. However, both nouns and adjectives presented higher probabilities to include a relational term compared to verbs, which presented higher probabilities of not including a categorical term. Furthermore, the probability for nouns to include a hyperonym (20%) was higher compared to the one for adjectives (13%) and verbs (3%).

Regarding age, the cumulative probability for younger children was a little higher for the lower ordered categories when compared to the older children (27%; and 15%, for the younger and older ones, respectively). That is, older children performed a little better than the younger ones regarding the categorical term of the definition. Even

though both younger (58%, and 52%, for nouns and adjectives, respectively) and older children definitions (58%, and 59% for nouns and adjectives, respectively) had a very high probability of including a relational term, the probability for the older children to include a hyperonym (27%, and 17%, for nouns and adjectives, respectively) was higher compared to the probability for younger children to include a hyperonym in their definiens (15%, and 9%, for nouns and adjectives, respectively) in their definitions. Both groups younger and older children tended not to include a categorical term in their verb *definiens*. Therefore, older children performed a little better than younger ones regarding the probability of including a hyperonym and a relational term in their definitions.

Finally, the level of abstraction of the words also affected the cumulative probability of the categorical term. Words with a low level of abstraction had a higher probability to include a relational term (55%, 59%, 40%, for nouns, adjectives and verbs, respectively) or a hyperonym (33%, 22%, 5%, for nouns, adjectives and verbs, respectively) compared to the percentage of relational terms (55%, 47%, 17%, for nouns, adjectives and verbs, respectively) and hyperonyms (12%, 7%, 1%, for nouns, adjectives and verbs, respectively) included in children's definiens for high-level-of-abstraction *definiendums*.

When nouns and adjectives had a high level of abstraction, the question "what is x?" tended to be responded with a relational term (55% and 47%, for nouns and adjectives, respectively) while definitions for verbs with a high level of abstraction had a very high probability of not including a categorical term (82%). Likewise, nouns and adjectives with a low level of abstraction had a high probability of including a relational term (55%; and 59%, for nouns and adjectives, respectively), compared to verbs, which had a higher probability of not including a categorical term (55%). Nouns and adjectives

presented higher probabilities to include a relational term compared to verbs, which presented higher probabilities of not including a categorical term. The probability for nouns to include a hyperonym was higher compared to the one for adjectives and verbs. And finally, words with a low level of abstraction had a higher probability to include a relational term or a hyperonym compared to words with a high level of abstraction. These trends provided support to our earlier findings in table 8, which showed main effects of the age, the morphological category and level of abstraction of the definiendum in the categorical term of the definiens.

2.6.5.2 Specificity of the Hyperonym

We ran an Ordered Logit Model to evaluate the performance of the participants on the specificity of the hyperonym the children produced in their definiens. This analysis allowed us to estimate the probability of the definiens to be in one of the following categories of the specificity of the hyperonym ordinal scale: absence of hyperonym, low specificity, middle specificity and high specificity. The dependent variable was the specificity of the hyperonym that children used in their definiens, measured with the ordinal scale presented above. The independent variables were measured in two levels: the variance at level 1, which varied at the individual level; and at level 2 the age and the community, which varied by students; and the morphological category and the level of abstraction of the definiendum, which varied by word. We also tested the possible effect of interactions of the variables age and morphological category; and level of abstraction and morphological category. Note that this analysis excludes the *don't know* cases. For the full array of responses, including the *no answer*, across the four different models see table B.3 in Appendix B. Table 10 below shows regression estimates for all cases of the specificity of the hyperonym scale across the four different models.

Table 10

Multilevel Ordinal Logistic Regression. Four Stage Analysis with Fixed and Random Effects Predicting the Probability of the Level of Specificity of the Hyperonym

		Model 1	Model 2	Model 3	Model 4
Fixed effects	Intercept	2.04*** (0.41)	0.81* (0.33)	0.75 (0.56)	0.28 (0.87)
	Thold 2	1.77*** (0.07)	1.76*** (0.07)	4.41*** (0.21)	4.41*** (0.21)
	Thold 3	2.14*** (0.08)	2.14*** (0.08)	6.89*** (0.33)	6.89*** (0.33)
L1: Student *word	Student mean variance			-5.34*** (0.20)	-5.33*** (0.21)
L2: Student level	Age			-0.10** (0.03)	-0.10** (0.03)
	Community			0.41 (0.49)	0.41 (0.49)
L2: Word level	Adjectives vs. Nouns		4.70*** (1.01)	2.58* (1.05)	6.30 (5.23)
	Verbs vs. Nouns		3.37*** (0.78)	3.71*** (0.92)	3.52* (1.47)
	Abstract			0.84*** (0.22)	0.85*** (0.22)
Students by Word Interaction	Age X Adj vs. N				0.03 (0.22)
	Age X Verbs vs. N				0.07 (0.18)
	Abstract X Adj vs. N				-3.02 (4.01)
	Abstract X Verbs vs. N				0.31 (3.19)
Variance components					
Level 2 - students	Student intercept $\sigma_{student}^2$	1.83*** (1.35)	1.81*** (1.35)	1.06*** (1.03)	1.06*** (1.03)
Level 2 - words	Word intercept σ_{word}^2	4.33*** (2.08)	1.78*** (1.33)	1.19*** (1.09)	1.19*** (1.09)
ICC students		.19	.26	.19	.19
ICC words		.46	.26	.21	.21
Pseudo R^2			.27	.41	.41

Note. Values enclosed in parentheses represent standard errors (for fixed effects) and standard deviation (for random parameters).
*p<.05 **p<.01 ***p<.001.

Results for model 2 in table 10 revealed that both adjectives and verbs had a higher probability than nouns to be in lower ordered categories in the specificity of the hyperonym scale (b=4.70, p<.001; b=3.37, p<.001, for adjectives and verbs, respectively). Therefore, when the morphological category changed from noun to adjective or verb, the probability for adjectives and verbs to be in a higher order category was lower than it was for nouns.

Model 3 showed that when the distance of the student's score on each word with respect to the student's mean (b=−5.34, p<.001) increased, the probability of being in a higher ordered category also increased, and variability within a student meant that events of higher categories were frequent in comparison with the absence of categorical term.

At the student level, results told us that the older the age of the students, the higher the probability to be in a higher ordered category (b=−0.10, p<.01), that is, older children had a higher probability to use a hyperonym with a high level of specificity than younger children. Coming from a monolingual or a bilingual community did not make a difference.

At the word level, results showed that the higher the level of abstraction of the words, the lower the category in the specificity of the hyperonym scale into which the student belonged (b=0.84, p<.001), that is, words with a higher level of abstraction showed cases of responses placed in the lower categories of the specificity of the hyperonym scale.

When the morphological category was paired with the variable level of abstraction of the definiendum the effect on adjectives and verbs prevailed. The probability of being in a lower ordered category was higher for adjectives and verbs, compared to nouns, (b=2.58 p<.05; b=3.71, p<.001, for adjectives and verbs, respectively). In other words, adjectives and verbs were more difficult to define regarding the specificity of the hyperonym than nouns. Therefore, noun definitions had higher probabilities to contain a

hyperonym with a higher level of specificity than adjective and verb definitions. We could see that the percentage of variance explained by the word level was higher in comparison with the percentage of variance explained by the students (21% and 19% for words and students, respectively).

Results for model 4 did not show any significant interaction between the age of the children and the complexity of the word and the original distribution across the different categories was similar.

2.6.5.2.1 Cumulative Probabilities

To complete the analysis of the specificity of the hyperonym we calculated the cumulative probability of the children's definiens to be in a certain category level of the specificity of the hyperonym ordinal scale without taking into account the *no answer*. These probabilities were calculated for different students characterized by deviation from the mean to show how different characteristics of students and words represented different probabilities to be on a specific category in the specificity of the hyperonym ordinal scale, and how the cumulative probability varied across different students and words. The probabilities for the mean are shown in the first column (noun) of table 11. Given that all continuous variables were centred around the mean, the probability for an average student was related to nouns (zero for adjectives and zero for verbs). The constant shift in these probabilities reflected the effect of the morphological category of the words. The age effect was illustrated by the younger and older ages (one standard deviation below and above the zero-mean, respectively), and the effect of the level of abstraction of the word was illustrated by the low and high level of abstraction (one standard deviation below and above the zero-mean, respectively).

Table 11 presents these cumulative probabilities for the different morphological categories, the age of the students, and the level of abstraction of the words.

Table 11

Predicted Cumulative Probabilites for the Ordered Categories of the Level of Specificity of the Hyperonym

		Morphological Category			Age		Abstraction	
MC	Scale Levels	Nouns	Adj	Verbs	Younger	Older	Low	High
Noun	Absence of Hyperonym	68	97	99	75	60	43	86
	Low Specificity	30	3	1	25	39	56	14
	Middle Specificity	2	—	—	—	1	1	—
	High Specificity	—	—	—	—	—	—	—
Adj	Absence of Hyperonym				98	95	91	99
	Low Specificity				2	5	9	1
	Middle Specificity				—	—	—	—
	High Specificity				—	—	—	—
Verb	Absence of Hyperonym				99	98	97	100
	Low Specificity				1	2	3	—
	Middle Specificity				—	—	—	—
	High Specificity				—	—	—	—

Note. The values represent mean percentages for each level of the ordinal scale.
Dashes indicate lack of answers for that level of the ordinal scale.

Results from table 11 showed that, for an average student, the cumulative probability for his definition not containing a hyperonym was very high (68%) compared to the probability of including a hyperonym with either one of the three levels of specificity (30%, 2%, and 0%, for low, middle, and high level of specificity, respectively). Adjectives definitions had a very high probability of not including a hyperonym (97%). In the case of verbs, the probability to be in the lower categories increased significantly compared to adjectives and nouns, being the absence of a hyperonym, like in the case of nouns and adjectives, the one with the higher percentage 99%. Therefore, verbs increased the probability for the lower categories. The morphology effect was linear. So that adjectives presented higher probabilities for the lower ordered categories, while verbs presented an even higher percentage probability for the lower ordered categories. That is, when students defined verbs, their performance was lower and put them into lower-ordered categories of the specificity of the hyperonym of the definition.

Regarding age, the cumulative probability for younger children was a little higher for the lower ordered category (absence of hyperonym) when compared to the older children, that is, the latter group performed better than the former one regarding the specificity of the hyperonym of the definition. In the case of older children, there was a higher percentage for the higher ordered categories (39%, and 1%, for low and middle level of specificity, respectively) compared to the percentage obtained by younger children (25%, and 0%, for low and middle level of specificity, respectively). It was consistent also for adjectives and verbs that older children performed a little better regarding the specificity of the hyperonym than younger children; the results show 5% of hyperonyms at the low level of specificity for older-children's adjective definitions vs. 2% at the same level for younger children; and 2% of hyperonyms at the low level of specificity for older-children's verb definitions vs. 1% at the same level for younger

children. Both younger and older children's definitions had a very high probability of not including a hyperonym (75%, 98%%, and 99% for nouns, adjectives and verbs, respectively) for younger children, and (60%, 95%, and 98% for nouns, adjectives and verbs, respectively) for older children.

Finally, the level of abstraction of the definiendum also affected the cumulative probability. Words with a high level of abstraction increased dramatically the probability for the lower ordered category, 86% probability of absence of a hyperonym for words with a high level of abstraction vs. 43% probability of the same category for words with a low level of abstraction.

However, words with a low level of abstraction increased the probability for higher ordered categories, 56% probability of higher level categories (low and middle level of specificity) for words with a low level of abstraction vs. 14% at the same levels for words with a high level of abstraction. It was also consistent for adjectives and verbs that words with a high level of abstraction showed up on the lowest ordered category of the scale (99% probability of absence of hyperonym for adjectives with a high level of abstraction vs. 91% probability of the same category for adjectives with a low level of abstraction; and 100% probability of absence of hyperonym for verbs with a high level of abstraction vs. 97% probability of the same category for verbs with a low level of abstraction). While words with a low level of abstraction increased the probability of higher ordered categories (9% probability of low level of specificity hyperonym for adjectives with a low level of abstraction vs. 1% probability for the same category for adjectives with a high level of abstraction; and 3% probability of low level of specificity hyperonym for verbs with a low level of abstraction vs. 0% probability for the same category for verbs with a high level of abstraction).

These trends provided support to our earlier findings showed in table 10 which showed main effects of the age, the morphological category and the level of abstraction of the definiendum.

2.6.5.3 Semantic Content of the Definiens

We ran an Ordered Logit Model to evaluate the performance of the participants on the production of semantic content in the definiens. This analysis allowed us to estimate the probability of the definitions to be in one of the following categories of the semantic content ordinal scale: absence of semantic content, deixis and tautology, contextual, Sindef (synonym, descriptive and functional) and definitional features.

The dependent variable was the semantic content the students used in their definitions, measured on an ordinal scale. The independent variables were measured in two levels: The variance at level 1, which varied at the individual level; and at level 2 the age and the community, which varied by students; and the morphological category and the level of abstraction of the definiendum, which varied by word. We also tested the possible effect of interactions of the variables age and morphological category; and level of abstraction and morphological category. Note that this analysis excludes the *don't know* cases. For the full array of responses, including the *no answer*, across the four different models, see table B.4 in Appendix B. Table 12 shows regression estimates for all cases of the semantic content scale across the four different models.

Table 12

Multilevel Ordinal Logistic Regression. Four Stage Analysis with Fixed and Random Effects Predicting the Probability of the Semantic Content of the Definiens

		Model 1	Model 2	Model 3	Model 4
Fixed effects	Intercept	-1.64*** (0.40)	-2.38*** (0.45)	-2.66*** (0.50)	-2.65*** (0.49)
	Thold 2	0.94*** (0.05)	0.94*** (0.05)	1.08*** (0.06)	1.08** (0.06)
	Thold 3	2.17*** (0.07)	2.17*** (0.07)	2.58*** (0.09)	2.58*** (0.09)
	Thold 4	5.44*** (0.12)	5.44*** (0.12)	6.52*** (0.15)	6.54*** (0.15)
L1: Student *word	Student mean variance			-1.12*** (0.05)	-1.13*** (0.05)
L2: Student level	Age			-0.10*** (0.02)	-0.11*** (0.02)
	Community			0.35 (0.32)	0.35 (0.32)
L2: Word level	Adjectives vs. Nouns		1.28 (1.01)	-0.52 (0.94)	3.04 (3.95)
	Verbs vs. Nouns		2.47** (0.89)	0.90 (0.78)	1.14 (1.20)
	Abstract			1.10*** (0.28)	1.13*** (0.28)
Students by Word Interaction	Age X Adj vs. N				0.04 (0.03)
	Age X Verbs vs. N				0.06 (0.04)
	Abstract X Adj vs. N				-3.12 (3.33)
	Abstract X Verbs vs. N				-0.52 (1.72)
Variance components					
Level 2 - students	Student intercept $\sigma_{student}^2$	0.21*** (0.46)	0.21*** (0.46)	0.53*** (0.73)	0.54*** (0.73)
Level 2 - words	Word intercept σ_{word}^2	4.97*** (2.23)	3.91*** (1.98)	2.47*** (1.57)	2.39*** (1.55)
ICC students		.02	.03	.08	.09
ICC words		.59	.53	.39	.38
Pseudo R^2			.13	.26	.27

Note. Values enclosed in parentheses represent standard errors (for fixed effects) and standard deviation (for random parameters).
*p<.05 **p<.01 ***p<.001.

Results for model 2 revealed that verbs were more difficult to define than nouns (b=2.47, p<.01), therefore, when the morphological category changed from noun to verb, the probability of being in a higher ordered category of the semantic content scale was lower for verbs compared to nouns. Model 3 showed that the distance of the student's score on each word with respect to the student's mean (b=−1.12, p<.001) told us that when this distance increased, the probability of being in a higher ordered category also increased, and variability within a student meant that events of higher ordered categories were frequent in comparison with the absence of semantic content.

At the student level we saw that the older the age of the children, the higher the probability to be in a higher ordered category (b=−0.10, p<.001), and coming from a monolingual or a bilingual community did not make a difference.

At the word level, results showed that the higher the level of abstraction of the definiendum, the lower the category in the categorical term scale into which the student belonged (b=1.10, p<.001), that is, words with a higher level of abstraction showed cases of responses placed in the lower categories of the semantic content scale. The morphological category of the definiendum did not make a significant difference when paired with the independent variable *level of abstraction of the definiendum*. However, when analysed alone, as model 2 showed, we found that verbs were more difficult to define than nouns regarding semantic content. Therefore, noun definitions presented higher probabilities to contain higher ordered categories in the scale of the semantic content than verb definitions.

We could see that the percentage of variance explained by the word level was higher in comparison with the percentage of variance explained by the students (39% and 8% for words and students, respectively).

The fourth model, did not show any significant interaction between the age and the complexity of the word and the original distribution across the different categories was similar.

2.6.5.3.1 Cumulative Probabilities

To complete the analysis of the semantic content of the definition, we calculated the cumulative probability of the children's definiens being in a certain category level of the semantic content ordinal scale without taking into account the *no answer*. These probabilities were calculated for different students, characterized by deviation from the mean, to show how different characteristics of students and words represented different probabilities to be on a specific category in the semantic content ordinal scale, and how the cumulative probability varied across different students and words. The probabilities for the mean are shown in the first column (noun) of table 13. Given that all continuous variables were centred around the mean, the probability for an average student was related to nouns. The constant shift in these probabilities reflected the effect of the morphological category of the words. The age effect was illustrated by the younger and older ages, and the level of abstraction effect was illustrated by the low level and the high level of abstraction of the definiendum.

Table 13 presents these cumulative probabilities for the different morphological categories, the age of the students, and the level of abstraction of the definiendum.

Table 13

Predicted Cumulative Probabilities for the Ordered Categories of the Semantic Content of the Definiens

		Morphological Category			Age		Abstraction	
MC	Scale Levels	Nouns	Adj	Verbs	Younger	Older	Low	High
Noun	Absence of SMC	6	5	14	9	5	2	21
	Deixis & Tautology	11	7	19	13	8	3	23
	Contextual	31	24	36	34	27	14	34
	Sindef	50	61	30	42	57	74	21
	Definitional Features	2	3	1	2	3	7	1
Adj	Absence of SMC				6	3	1	13
	Deixis & Tautology				9	5	2	18
	Contextual				29	20	9	36
	Sindef				54	67	76	32
	Definitional Features				2	5	12	1
Verb	Absence of SMC				19	11	4	39
	Deixis & Tautology				22	16	7	26
	Contextual				34	35	26	25
	Sindef				24	37	60	10
	Definitional Features				1	1	3	—

Note. The values represent mean percentages for each level of the ordinal scale
Dashes indicate lack of answers for that level of the ordinal scale.

Results from table 13 showed that the cumulative probability for an average student to answer the question "what is x?" including semantic content in the definiens expressed through one of the higher ordered categories of the semantic content ordinal scale was of 83%, compared with the probability of the absence of semantic content (7%) and the probability to provide a deictic or tautological term (11%). Table 13 showed that Sindef was the preferred category for children to express the semantic content for nouns (50%). In the case of adjectives, the cumulative probability of being in the higher ordered categories of the semantic content was higher than it was for nouns (89%). Like in the case of nouns, adjective definitions had a high probability of expressing semantic content through a synonym, definitional features, or functional characteristics (61%). In the case of verbs, the probability to be in the lower categories increased significantly compared to adjectives and nouns, and the cumulative probability for the first two lower categories (*absence of semantic content* and *deixis or tautological term* was of 25%. However, and unlike in the case of nouns and adjectives, the semantic content of verb *definiendums* was expressed through contextual features (36%). Therefore, verbs increased the probability for the lower ordered categories. The morphology effect was non-linear yet monotonic. So that adjectives presented lower probabilities for the lower ordered categories, while verbs presented the opposite. That is, when students defined verbs, their performance was lower and put them into lower-ordered categories of the semantic content of the definiens.

Regarding age, the cumulative probability for younger children was higher for the lower ordered categories when compared to the older children, that is, older children performed better than the younger ones regarding the semantic content of the definiens. In the case of older children, there was a higher percentage of the highest ordered categories (57%, and 3%, for *sindef* and *definitional features*, respectively) compared to

the percentage obtained by younger children (42%; and 1%, for *sindef* and *definitional features*, respectively). It was consistent also for adjectives and verbs that older children showed up on higher ordered categories, while younger children showed up on lower ordered categories, 5% of *definitional features* (highest ordered category level) for older children adjectives' definitions vs. 2% at the same level for younger children; and 1.2% of definitional features for older children's verb definitions vs. 0.6% at the same level for younger children. Both groups' definitions had a very high probability of expressing the semantic content of the definiens through *sindef* characteristics (42%, 54%, for nouns and adjectives, respectively) for younger children. In the case of verbs, younger children's definiens had a high probability of expressing semantic content through contextual features (34%).

Older children's definitions had a very high probability of including semantic content expressed through *sindef* (57%, 67% and 37%, for nouns, adjectives and verbs, respectively).

Finally, the level of abstraction of the words also affected the cumulative probability. Words with a high level of abstraction increased the probability for the lower ordered categories, 29% probability of lower level categories for words with a high level of abstraction vs. 10% probability of the same categories for words with a low level of abstraction. On the contrary, words with a low level of abstraction increased the probability for higher ordered categories, 95% probability of higher level categories for words with a low level of abstraction vs. 56% at the same levels for words with a high level of abstraction. It was also consistent for adjectives and verbs that words with a high level of abstraction increased the probability for lower ordered categories, 32% probability of lower level categories for adjectives with a high level of abstraction vs. 3% probability of the same categories for adjectives with a low level of abstraction; and

66% probability of lower level categories for verbs with a high level of abstraction vs. 12% probability of the same categories for verbs with a low level of abstraction. While a low level of abstraction increased the probability of higher ordered categories, 97% probability of higher ordered categories for adjectives with a low level of abstraction vs. 68% probability for the same categories for adjectives with a high level of abstraction; and 88% probability of higher ordered categories for verbs with a low level of abstraction vs. 34% probability for the same categories for verbs with a high level of abstraction. When words had a high level of abstraction, the question "what is x?" had a higher probability to be responded with contextual features (34% and 36%, for nouns and adjectives, respectively) except in the case of verbs, for which the question "what is x?" had a higher probability of not including semantic content (39%). However, when words had a low level of abstraction, there was a higher probability for the semantic content of the definiens to be expressed through *sindef* (73%, 76% and 59%, for nouns, adjectives and verbs, respectively), that is, through a synonym, descriptive features or functional features.

As a summary, while semantic content for noun and adjective definiens was expressed through *sindef*, the semantic content of verbs' definiens was expressed through contextual characteristics. Older children performed a little better than younger ones, even though they used the same levels in the scale to introduce the semantic content of the definiens. And words with a low level of abstraction obtained a higher probability to express the semantic content of the definiens through *Sindef*, while definiendums with a higher level of abstraction either did not contain semantic content, as in the case of verbs, or participants expressed it through contextual characteristics, as in the case of nouns and adjectives. These trends provided support to our findings of table 12, which

showed main effects of the age, the morphological category and the level of abstraction of the definiendum.

2.6.6 Syntactic-Semantic Dimension

In the previous sections of our analysis we looked, separately, at the syntactic complexity; the categorical term; the specificity of the hyperonym; and the semantic content of noun, adjective and verb definitions. In this part of the analysis, we were interested at looking at whether an increase in the syntactic complexity of the children definitions had a possible effect on the three semantic sub-dimensions of the word definition performance, that is, if an increase in the syntactic complexity of the word definition increased the probability of the categorical term, the specificity of the hyperonym and the semantic content of the definition to be in higher ordered categories in the respective semantic scales we elaborated to analyse the semantic part of the definitions.

For this last part of the analysis, we included in one model both syntactic and semantic dimensions of our definitions in order to test the correlation between the two parts of the analysis. We ran an ordered logit model using the semantic ordinal scales of the semantic sub-dimensions as the dependent variables and regressed them against the syntactic categories of the syntax complexity scale as level-one independent variable (P1 was taken as a continuous variable). We controlled by the rest of the independent variables: The age of the children and the community; and the level of abstraction of the word and the morphological category of the definiendum as level two variables. We also controlled by the variance at level 1 (*var*), which gave us the ability not only to define variance within a student, but also to define variance within a student between the different morphological categories.

We presented the results for the syntactic-semantic dimensions in three different tables, each one explained the effect of the syntactic complexity on each one of the three sub-dimensions of the semantic dimension of the definition across three different models. The first one, table 14, presented the sub-dimension *categorical term* as the dependent variable (without the *don't know* answers) which was measured on an ordinal scale with the following values: absence of categorical term; relational term; and hyperonym. The independent variable was P1 (at level 1, syntax complexity scale taken as a continuous variable). The second one, table 15, presented the sub-dimension *specificity of the hyperonym* as the dependent variable (without the *don't know* answers), which was measured on an ordinal scale with the following values: absence of hyperonym; low specificity; middle specificity; and high specificity. The independent variable was P1 (at level 1, syntax complexity scale taken as a continuous variable). Finally, the last table, table 16, presented the sub-dimension *semantic content* as the dependent variable (without the *don't know* answers) which was measured on an ordinal scale with the following values: absence of semantic content; deixis and tautology; contextual; *sindef*; and definitional features. The independent variable was P1 (at level 1, syntax complexity scale taken as a continuous variable).

Table 14

Multilevel Ordinal Logistic Regression. Four Stage Analysis with Fixed and Random Effects Predicting the Probability of the Syntactic Complexity on the Categorical Term of the Definiens

		Model 1	Model 2	Model 3	Model 4
Fixed effects	Intercept	0.55* (0.26)	0.56* (0.26)	-1.59*** (0.41)	-1.60*** (0.40)
	Thold 2	0.93*** (0.04)	0.98*** (0.05)	2.70*** (0.14)	2.71*** (0.14)
L1: Student *word	P1 Intercept		-0.31*** (0.03)	-0.19*** (0.04)	-0.19*** (0.04)
L1: Student *word	Student mean variance			-6.25*** (0.22)	-6.27*** (0.22)
L2: Student level	Age			-0.10*** (0.03)	-0.13*** (0.03)
	Community			1.47 (0.37)	1.49 (0.37)
L2: Word level	Adjectives vs. Nouns			0.78 (0.50)	0.80 (1.81)
	Verbs vs. Nouns			2.44*** (0.46)	3.27*** (0.69)
	Abstract			0.53*** (0.14)	0.55*** (0.14)
Students by Word Interaction	Age X Adj vs. N				0.08 (0.05)
	Age X Verbs vs. N				0.06 (0.08)
	Abstract X Adj vs. N				-0.07 (1.52)
	Abstract X Verbs vs. N				-1.78 (1.10)
Variance components					
Level 2 - students	Student intercept $\sigma_{student}^2$	1.47*** (1.21)	1.14*** (1.07)	0.47*** (0.68)	0.47*** (0.68)
Level 2 - words	Word intercept σ_{word}^2	1.53*** (1.24)	1.65*** (1.28)	0.44*** (0.66)	0.39*** (0.62)
ICC students		.23	.19	.11	.11
ICC words		.24	.27	.10	.09
Pseudo R^2			.03	.33	.34

Note. Values enclosed in parentheses represent standard errors (for fixed effects) and standard deviation (for random parameters).
*p<.05 **p<.01 ***p<.001.

Results for model 3 in table 14 showed that the syntactic complexity affected the categorical term of the definition. An increase in the complexity of the syntactic structures the children used to define the words, brought an increase in the probability to be in a higher ordered category for the categorical term of the definition. If we take a look at the syntactic complexity coefficient (P1 Intercept) ($b=-0.19$ $p<.001$) we can see that when the syntactic complexity of nouns, verbs and adjectives increased, the probability for the categorical term of the definition to be in a higher ordered category of response also increased. That is, an increase in the syntactic complexity of noun, verb and adjective definitions entailed an increase in the semantic complexity of the categorical term of the definition.

Table 15

Multilevel Ordinal Logistic Regression. Four Stage Analysis with Fixed and Random Effects Predicting the Probability of the Syntactic Complexity on the level of Specificity of the Hyperonym

		Model 1	Model 2	Model 3	Model 4
Fixed effects	Intercept	2.01*** (0.41)	2.04*** (0.41)	0.54 (0.53)	0.54 (0.53)
	Thold 2	1.76*** (0.07)	1.79*** (0.08)	4.60*** (0.22)	4.61*** (0.22)
	Thold 3	2.13*** (0.08)	2.16*** (0.09)	6.90*** (0.32)	6.90*** (0.32)
L1: Student *word	P1 Intercept		-0.23*** (0.03)	-0.37*** (0.04)	-0.37*** (0.04)
L1: Student *word	Student mean variance			-5.39*** (0.21)	-5.38*** (0.21)
L2: Student level	Age			-0.10** (0.03)	-0.10** (0.03)
	Community			0.68 (0.46)	0.68 (0.46)
L2: Word level	Adjectives vs. Nouns			2.82** (1.03)	7.00 (5.18)
	Verbs vs. Nouns			3.83*** (0.92)	3.69* (1.47)
	Abstract			0.85*** (0.22)	0.86*** (0.22)
Students by Word Interaction	Age X Adj vs. N				0.04 (0.21)
	Age X Verbs vs. N				0.06 (0.21)
	Abstract X Adj vs. N				-3.41 (3.96)
	Abstract X Verbs vs. N				0.21 (3.29)
Variance components					
Level 2 - students	Student intercept $\sigma_{student}^2$	1.79*** (1.34)	1.50*** (1.23)	0.82*** (0.90)	0.82*** (0.91)
Level 2 - words	Word intercept σ_{word}^2	4.28*** (2.07)	4.47*** (2.11)	1.12*** (1.06)	1.11*** (1.05)
ICC students		.19	.16	.16	.16
ICC words		.46	.48	.21	.21
Pseudo R^2			.01	.44	.44

Note. Values enclosed in parentheses represent standard errors (for fixed effects) and standard deviation (for random parameters).
*p<.05 **p<.01 ***p<.001.

Results for model 3 in table 15 showed that the syntactic complexity affected the specificity of the hyperonym of the definition. An increase in the complexity of the syntactic structures the children used to define the words brought an increase in the probability to be in a higher ordered category for the specificity of the superordinate term of the definition. If we take a look at the syntactic complexity coefficient (P1 Intercept) ($b=-0.37$ $p<.001$) we can see that when the syntactic complexity of nouns, verbs and adjectives increased, the probability for the hyperonym to be in a higher ordered category of specificity also increased. That is, an increase in the syntactic complexity of noun, verb and adjective definitions entailed an increase in the specificity of the hyperonym, and therefore, in the semantic complexity of the definition.

Table 16

Multilevel Ordinal Logistic Regression. Four Stage Analysis with Fixed and Random Effects Predicting the Probability of the Syntactic Complexity on the Semantic Content of the Definiens

		Model 1	Model 2	Model 3	Model 4
Fixed effects	Intercept	-1.64***	-1.71***	-2.86***	-2.85***
		(0.41)	(0.41)	(0.48)	(0.47)
	Thold 2	0.93***	0.96***	1.10***	1.10***
		(0.05)	(0.06)	(0.07)	(0.07)
	Thold 3	2.13***	2.19***	2.58***	2.58***
		(0.07)	(0.08)	(0.09)	(0.09)
	Thold 4	5.47***	5.61***	6.66***	6.67***
		(0.12)	(0.13)	(0.15)	(0.15)
L1: Student *word	P1 Intercept		-0.25***	-0.25***	-0.25***
			(0.02)	(0.02)	(0.02)
L1: Student *word	Student mean variance			-1.10***	-1.10***
				(0.06)	(0.05)
L2: Student level	Age			-0.09***	-0.11***
				(0.02)	(0.02)
	Community			0.45	0.45
				(0.30)	(0.30)
L2: Word level	Adjectives vs. Nouns			-0.48	3.41
				(0.92)	(3.84)
	Verbs vs. Nouns			1.03	1.26
				(0.76)	(1.17)
	Abstract			1.14***	1.18***
				(0.27)	(0.27)
Students by Word Interaction	Age X Adj vs. N				0.04
					(0.03)
	Age X Verbs vs. N				0.06
					(0.04)
	Abstract X Adj vs. N				-3.40
					(3.24)
	Abstract X Verbs vs. N				-0.49
					(1.70)
Variance components					
Level 2 - students	Student intercept $\sigma_{student}^2$	0.18***	0.10***	0.43***	0.43***
		(0.42)	(0.31)	(0.65)	(0.65)
Level 2 - words	Word intercept σ_{word}^2	5.12***	5.26***	2.34***	2.25***
		(2.26)	(2.29)	(1.53)	(1.50)
ICC students		.02	.01	.07	.07
ICC words		.60	.61	.39	.38
Pseudo R^2			-.01	.29	.31

Note. Values enclosed in parentheses represent standard errors (for fixed effects) and standard deviation (for random parameters).
*p<.05 **p<.01 ***p<.001.

Results for model 3 in table 16 showed that the syntactic complexity affected the semantic content of the definition. An increase in the complexity of the syntactic categories the children used to define words, brought an increase in the probability to be in a higher ordered category for the semantic content of the definition. If we take a look at the syntactic complexity coefficient (P1 Intercept) ($b=-0.25$ $p<.001$) we can see that when the syntactic complexity of nouns, verbs and adjectives increased, the probability for the semantic content of the definition to be in a higher ordered category of response also increased. That is, an increase in the syntactic complexity of noun, verb and adjective definitions entailed an increase in the semantic complexity of the semantic content of the definition.

In the next section, we will discuss the implications of the results obtained. The conclusions would be centred in the results presented throughout the study, that is, those that exclude the *don't know* answers.

Summary of Analyses and Results for Study 1

Analysis Performed	Objective of the Analysis	Obtained Results
Multilevel Binary Logistic Regression	Test the probability of the students answering *don't know*	• Higher probability of *don't know* answers for words with a high level of abstraction. • Higher probability of *don't know* answers for Verbs (V) compared to Nouns (N) (no effect of Morphological Category for model 3) • Words explain higher percentage of variance than students.
Multilevel Regression	Test mean variance on the syntactic dimension	• Higher variance for words with a higher level of abstraction. • Verbs present less variation than nouns (because verbs have a higher percentage of *don't know*).
Multilevel Ordinal Logistic Regression	Predict the probability of the syntactic complexity of the *definiens'* structure	• No effect of age of the children. • No effect of the level of abstraction. • Verbs more difficult to define than nouns. • Students explain higher percentage of variance than words.
Cumulative Probabilities for Syntactic Complexity	Calculate the probability of answers for each level of the scale	• Morphological Category: o Presentence Structures for N, Adj. and V. Verbs have lower % of answers in higher ordered categories, compared to N. • Age: o Younger: use Presentence Structures for N, Adj. & V. o Older: use Presentence Structures for N, Adj. & V. • Abstraction: o Low: Presentence Structures for N, Adj. and V o High: Presentence Structures for N, Adj. and V

Summary of Analyses and Results for Study 1

Analysis Performed	Objective of the Analysis	Obtained Results
Multilevel Ordinal Logistic Regression	Predict the probability of the categorical term	• Older children are in higher ordered categories • Higher abstraction brings lower level in the CT scale. • Verbs more difficult to define than nouns (Model 2: adjectives and verbs more difficult to define than nouns). • Students explain a little higher percentage of variance than words.

Cumulative Probabilities for Categorical Term	Calculate the probability of answers for each level of the scale	• Morphological Category:
		  o Relational Term for N, and Adj. Nouns higher % of hyperonyms compared to Adj. and V.
		  o Absence of Categorical Term for V
		• Age:
		  o Younger: Relational Term for N, and Adj. Absence of CT for Verbs
		  o Older: use Relational Term for N, and Adj. Absence of CT for Verbs. Older have a higher probability than younger to include a hyperonym.
		• Abstraction:
		  o Low: Relational Term for N and Adj. Absence of CT for Verbs. Higher percentage of hyperonyms for low abstraction compared to high.
		  o High: Relational Term for N and Adj. Absence of CT for Verbs

Multilevel Ordinal Logistic Regression	Predict the probability of the specificity of the hyperonym	• Older children are in higher ordered categories of specificity. • Higher abstraction brings lower level in the specificity of the hyperonym. • Adjectives and verbs more difficult to define than nouns. • Words explain higher percentage of variance than students.

Summary of Analyses and Results for Study 1

Analysis Performed	Objective of the Analysis	Obtained Results

Cumulative Probabilities for Specificity of the Hyperonym	Calculate the probability of answers for each level of the scale	• Morphological Category:
		  o Absence of Hyperonym for N, Adj. and V
		• Age:
		  o Younger: Absence of Hyperonym for N, Adj. and V
		  o Older: Absence of Hyperonym for N, Adj. and V. Older obtained a higher % of answers for *low specificity* compared to the % obtained by younger children.
		• Abstraction:
		  o Low: Low specificity for N. Absence of Hyperonym for Adj. and V
		  o High: Absence of Hyperonym for N, Adj. and V

Multilevel Ordinal Logistic Regression	Predict the probability of semantic content of the *definiens*	• Older children are in higher ordered categories of semantic content. • Higher abstraction brings lower levels in the semantic content scale. • Model 2: Verbs more difficult than nouns (morphological category only has effect on its own) • Words explain higher percentage of variance than students.

Cumulative Probabilities for Semantic Content of the *Definiens*	Calculate the probability of answers for each level of the scale	• Morphological Category:
		  o *Sindef* for N and Adj. Contextual for V.
		• Age:
		  o Younger: *Sindef* for N and Adj. Contextual for V.
		  o Older: *Sindef* for N, Adj. and V. Even though they use the same categories, the percentage in those categories is higher for older students.
		• Abstraction:
		  o Low: *Sindef* for N, Adj. and V
		  o High: Contextual for N and Adj. Absence of SM C for V.

Summary of Analyses and Results for Study 1

Analysis Performed	Objective of the Analysis	Obtained Results
Multilevel Ordinal Logistic Regression	Predict the effect of syntactic complexity on the categorical term; the specificity of the hyperonym; and the semantic content of the *definiens*	• An increase in the syntactic complexity of N, Adj. and V definitions entails an increase in the semantic complexity of the categorical term; the specificity of the hyperonym; and on the complexity of the semantic content of the *definiens*

2.7 Discussion

The primary purpose of this study was to explore the syntactic and semantic dimensions of 7-year-old Spanish children's definitions of concrete and abstract nouns, adjectives and verbs. We remind here the specific questions for the independent variables related to the characteristics of the words and the characteristics of the students for this first study. Regarding the morphological category of the definiendum, our specific questions were: (a) how do Spanish children's noun and adjective definitions compare in terms of syntactic dimension? (b) how do Spanish children's noun and verb definitions compare in terms of syntactic dimension? (c) how do Spanish children's noun and adjective definitions compare in terms of semantic dimension? and (d) how do Spanish children's noun and verb definitions compare in terms of semantic dimension?

As regards the variable level of abstraction of the definiendum, our specific question for this first study was: how do Spanish children's syntactic and semantic dimensions of noun, adjective and verb definitions compare in terms of the level of abstraction of the definiendum?

As predicted, this study showed that there was a generalized effect of the morphological category of the *definiendum* on the syntactic and semantic dimension of the definition. However, against expectations, the impact of the level of abstraction of the *definiendum* was more restricted. Level of abstraction only explained significantly the differences in the components of the semantic dimension. Moreover, this study showed that the level of syntactic complexity of the *definiens* was directly related to the three main aspects considered in the semantic dimension of the definition. Finally, we found an effect of age. In the following lines we elaborate on each of these findings.

Regarding the effect of the morphological category of the *definiendum*, we found that although the morphological category of the *definiendum* affects both syntactic and semantic dimensions of the definition, its effect on the syntactic dimension differs from the effect on the semantic dimension. On the syntactic dimension, the morphological category has a restricted effect, it impacts only the distribution of the most complex syntactic structures with which children define nouns, adjectives and verbs. And, verbs present lower percentages of answers in the higher category levels of the syntactic complexity scale, compared to nouns and adjectives.

In contrast, the morphological category affects every component of the semantic dimension of the definition. Regarding the categorical term of the *definiens*, results revealed that noun *definiens* contained a higher percentage of hyperonyms compared to adjectives and verbs, and children did not use a categorical term to define verbs (70% of the answers did not include a categorical term), while nouns and adjectives were categorized with a relational term. In this study, 21% of noun definiens contained a hyperonym, this percentage, though lower to the one obtained by some early studies is similar to the percentage of hyperonyms that Skwarchuk and Anglin (1997) found for nouns (29%). This pattern of results may be accounted for by the different organization of the mental lexicon for different morphological categories. Researchers (e.g., Markman, 1989; Miller, 1991; Rosch & Mervis, 1975; Johnson & Anglin, 1995; Skwarchuk & Anglin, 1997; Marinellie & Johnson, 2003; 2004) have suggested that nouns are organized hierarchically with many levels of available superordinates and this structure. However, hyperonyms may be more difficult for adjectives and verbs because the hierarchical relations that may exist between concepts represented by these parts of speech are shallower and not a prevalent (Anglin, 1985; Skwarchuk and Anglin, 1997) as those for nouns.

Regarding the specificity of the hyperonym, results revealed that the percentage of hyperonyms produced for adjectives and verbs were lower in specificity in comparison with hyperonyms provided for noun definiens. The cumulative probability analysis showed that the absence of hyperonym was the level of the scale with a higher percentage of answers for all three morphological categories. However, when hyperonyms were provided, nouns had a 30% probability of containing a hyperonym with a low level of specificity, and a 2% probability of containing a hyperonym with a middle level of specificity. On the contrary, adjectives and verbs had only 3% and 1% probability, respectively, of containing a hyperonym with a low level of specificity, and no hyperonyms of middle level of specificity were provided neither for adjectives nor for verbs. The results for the specificity of the hyperonym are strictly related to the results of the categorical term of the definiens. It seems that hyperonyms are easier to produce for nouns than for adjectives and verbs, maybe because as some authors have pointed out, nouns tend to be organized hierarchically into categories with many hyperonyms available (e.g., Rosch & Mervis, 1975; Skwarchuk & Anglin, 1997), and although verbs may also be organized into semantic hierarchies (e.g., Booth & Hall, 1995), the structure of them, according to some authors, tends to be shallower (e.g., Anglin, 1985) regarding the number of levels available. Consequently, this reduces the number of available hyperonyms for verbs compared to nouns. Finally, as some authors have pointed out, although it is possible for adjectives to be organized hierarchically, this hierarchical structure is not as pronounced as in the structure for nouns (e.g., Swarchuk & Anglin, 1997).

Regarding the semantic content of the *definiens*, results revealed than noun and adjective definiens contained more precise and formal semantic content compared to verb definitions, in other words, noun and adjective definiens contained higher

definitional power than verb definiens. Verbs were defined in terms of their contextual characteristics (e.g., *Que*, *por ejemplo*, *estamos hablando muy alto y los demás están trabajando*, 'That, for example, we are talking very loud and the others are working' for the definiendum *estorbo* 'nuisance'); while nouns and adjectives were defined in terms of a synonym, the external characteristics/property of the definiendum, or the function fulfilled by the definiendum (e.g., *Una iglesia con campanas* 'a church with bells' for the definiendum *campanario* 'bell tower'; *Es para que no nos mojemos* 'so we wouldn't get wet' for the definiendum *paraguas* 'umbrella'). These results could be explained because, as some authors have pointed out (e.g., Marinellie and Johnson, 2004), noun and adjectives might have clearer referents and be conceptually simpler than verbs.

Regarding the effect of the level of abstraction of the *definiendum*, we found that on the syntactic dimension, though no effect of the level of abstraction was found, differences are observed on the distribution of the most complex syntactic structures with which children define nouns, adjectives and verbs. And, verbs present lower percentages of answers in the higher category levels of the syntactic complexity scale, compared to nouns and adjectives. In contrast, the level of abstraction of the definiendum affects every component of the semantic dimension of the definition.

Our study showed that regardless of the level of abstraction of the word, children defined nouns, adjectives and verbs with a presentence structure. However, differences were found on the most complex syntactic structures with which children defined nouns, adjectives and verb. In this sense, the percentage of relative clauses (the most complex syntactic structure in our scale) was always higher for word with a low level of abstraction compared with the percentage for words with high levels of abstraction. Also the percentage of complex sentences structures used to define noun, adjectives and

verbs was always higher for low abstraction words than for high level of abstraction words.

However, the impact of the level of abstraction of the *definiendum* was significant on the semantic dimension of the definition, that is, in the categorical term, the specificity of the hyperonym, and in the semantic content of the *definiens*. Results showed that low abstraction nouns presented higher probabilities to contain a hyperonym with a low level of specificity and semantic content expressed in terms of the external characteristics/property of the definiendum or the function fulfilled by the definiendum. An increase in the level of abstraction of the *definiendum* augmented the probabilities for the lower ordered level categories in the three sub-dimensions of the semantic dimension affecting adjectives and verbs at a higher level compared to nouns. Abstract nouns, adjectives and verbs were very difficult to define for 7-year-old children. Even though adjectives, as well as nouns, presented the higher percentage for relational terms for *definiendums* with a low level of abstraction, nouns seem to be the morphological category less permeable to changes in the level of abstraction of the *definiendum*, maybe because noun have clearer referents compared to adjectives and verbs.

As for the relation between the syntactic dimension and the semantic dimension of definitions, we examined whether an increase in the syntactic complexity of the definitions would affect the complexity of the semantic dimension of definitions. Our study revealed that when the syntactic complexity of noun, adjective and verb definitions increased, the probability for the categorical term, the specificity of the hyperonym and the semantic content of the definiens to be in a higher ordered level of response also increased. That is, an increase in the syntactic complexity of the structures participants used in their noun, adjective and verb definitions entail an increase in the semantic complexity of the categorical term, of the specificity of the hyperonym and of

the semantic content of the *definiens*. To explain this results it could be helpful to think about the higher level of syntactic complexity, that is, a relative clause. When a child produces a relative clause definiens, the probability that the definiens include a hyperonym are much higher than the probability to find an hyperonym in a complex sentence, as to structure the definiens as a relative clause, children would have to include a hyperonym first. Since the semantic content of definitions is expressed through a clause or a proposition, an increase in the syntactic complexity of this proposition could lead to expressing semantic content in a more complex way, adding embedded content, making longer sentences and with more embedding. These results suggest not only that the two dimensions of word definitions are related, but also that the syntactic aspects appear to lead the semantic aspects of definitions.

Even though the students in our sample were in a very reduced age range, from 6 to 7 years old, we wanted to explore the possibility of an age effect, as previous studies have reported that by age 7 children start spontaneously including hyperonyms in their definition, therefore, we wanted primarily to evaluate whether the older children would produce a higher number of hyperonyms and of better quality (i.e. specificity level) in their definitions. Our results showed a mild effect of age of the participants only on the semantic dimension of the definition. Though the age of the participants had no effect on the complexity of the syntactic structures of the definiens, differences were observed on the distribution of the most complex syntactic structures with which children define nouns, adjectives and verbs. Older children exhibited a higher percentage of use of complex sentences and relative clauses in the definiens of noun, adjectives and verbs, compared to younger children.

However, we found that the age of the students affected mildly the three semantic sub-dimensions. Older children presented higher probabilities than younger children to include a hyperonym with a low level of specificity in their categorical term, especially for nouns, in which differences are higher between older and younger children. Regarding semantic content of the definiens, older children showed a little advantage over the younger ones when defining verbs, as older children expressed semantic content for verbs through descriptive or functional characteristics, while younger children expressed semantic content for verbs through the context of use of that verb (i.e. contextual level). As previous studies have reported (e.g., Snow, 1990; Watson, 1985) these results could be explained perhaps because older children, have had more practice defining words, and have been more exposed to formal definitions, provided by their teachers, for nouns that take greater advantage for hyperonyms and concrete or function information.

Finally, the last conclusion that our study offers has to do with the percentage of variance that comes explained by the characteristics of the words (i.e., the morphological category and the level of abstraction of the *definiendum*) and by the characteristics of the students (i.e., age). The results offered in this study revealed that the **characteristics of the students are more important** than the characteristics of the words in order to explain the differences **in the performance of the syntactic complexity** of the *definiens*' structure **and in the categorical term** of the *definiens*. However, the characteristics of the words seem to be more important to explain the differences in the specificity of the hyperonym and in the semantic content of the *definiens*. These results could be explained maybe because the syntactic dimension appears to lead the semantic aspects included in 7-year-old children's definitions. Older students used more complex syntactic structures to define nouns, adjectives and verbs than younger students, moreover, older students included more hyperonyms in their definiens than younger students, indicating that maybe, hyperonyms are included. Even though the syntactic structure younger and older children used to define nouns, adjectives and verbs is the same one (pre-sentence structures), older students exhibited higher percentages of use of structures placed in the higher levels of the syntactic complexity scale (complex sentence and relative clause) compared to the younger ones. However, our results showed that the morphological category and the level of abstraction of the definiendum are more important to explain the difference in the specificity of the hyperonym and in the semantic content of the definiens. Unlike the results for the syntactic structure and the categorical term of the definiens, older children did not exhibit higher percentages of use in the higher levels of the scale neither for the level of specificity of the hyperonym nor for the semantic content of the definiens. However, the higher percentages of use in the higher levels in the scale are

placed in the morphological category and in the level of abstraction of the definiendum. This would be the reason why the characteristics of the words are more important than the characteristics of the subjects to explain the difference in these two components of the semantic dimension. Maybe because, even though 7-year-old children used hyperonyms, mostly for nouns, the ones used were 'all-purpose class terms' (Litowitz, 1977), that is, terms such as 'something', 'someone', or 'a thing', so it seems that children are still in a state in which they are using these non-specific hyperonym as an early step before they can use more specific and adequate hyperonyms. In the case of the semantic content, as in the specificity of the hyperonyms, children seem still in an initial state of development in which semantic content is expressed through the function of the definiendum, in the case of artifacts, or through characteristics or properties of the definiendum, as in the case of animals and natural kinds.

The results in our study show that children have a long developmental path ahead to become proficient definers and give successful definitions regarding the formal structure and the semantic component of the definition.

3. STUDY 2: ADULTS' DEFINITIONS

3.1 Introduction

What are the implications of the previous developmental findings on the improvement of form and content of word definitions in children for adults' word definitions?

In contrast to what was found for children, different studies have reported the inclusion of superordinate terms (percentage higher than 80%) in the majority of adult noun definitions (Storck & Looft, 1973; Wehren et al., 1981; McGhee-Bidlack 1991). Moreover, most adults' definitions of nouns conform the 'conventional linguistic form' (an X is a Y that Z). This finding is usually interpreted in the light of the effect of literacy and schooling in the shaping of adult's definitional formal skills. This effect is usually understood in terms of the high exposure to the use of definitions in specialized written discourse that adults experience in their cultural contexts (Watson & Olson, 1987; Iris, Litowitz, & Evens, 1988; Snow, 1990: Watson, 1985, Keil, 1985). Most participants in these studies were middle-class adults from university contexts (Anglin, 1977; Wehren et al., 1981; Benelli et al., 1988; McGhee-Bidlack, 1991; Benelli et al., 2006), a context that regularly requires the production of formal definitions.

The research undertaken by Luria (1976), with peasants in Uzbekistan, presents an exception to this pattern. Luria found that unschooled adults defined common nouns in terms of perceptual or functional features, and some made no attempt at all to define words, instead, they 'framed' the *definiendum* into a 'little story' in which the noun *definiendum* was involved. Interestingly, after these adults began to attend literacy classes, the definitions they provided changed, as they began to include a low level of specificity hyperonym ('something that', 'a thing that') equivalent to what a 6-year-old child would do, starting by introducing broad categorical terms, that in time (and with practice in schooling and literacy), would become proper superordinate terms. Thus,

Luria's results confirmed previous interpretations as to the crucial effect of literacy and schooling in developing formal definitional skills (by formal here, I mean the inclusion of a categorical term of high specificity and definitional features in the semantic content. I'm not talking about a relative clause). In the same line, Walker (2001) studied the relationship between literacy/schooling and formal noun definitions in adults of low-income rural (range: 24 to 70 years) and urban (range: 20 to 64 years) American contexts. Walker asked the two group of adults to define four object nouns (e.g., *cigarette*, *trailer*, *taxi*, and *computer*), and four social nouns (e.g., *husband*, *farmer*, *dentist*, and *policeman*). Her results indicated that 80% of the urban group adults included superordinate terms in their definitions, while the percentage for the rural group was 36%. The proportion of definitions with the 'formal' form (a statement of equivalence, NP1 = NP2, inclusion of the superordinate, and criterial information (this classification comes from Johnson & Anglin, 1995) was 69% for the urban adults, while the percentage of 'formal' definitions among rural adults was only 13%.

A more recent study conducted by Benelli, Belacchi, Gini & Lucangeli (2006) documented a better performance by highly educated adults of normative Aristotelian definitions (i.e. "metalinguistic definitions"), which according to them would be "answers explicitly stating the linguistic-grammatical category of the definiendum", for example 'innocent (definiendum) is the opposite of guilty'. Adults of a middle SES with low (i.e. middle school certificate) and high (i.e. high school or university diploma) educational levels (ages 24-31; n=80) defined four concrete and four abstract nouns (e.g., 'clown', 'donkey', 'ability', 'kindness'); four concrete and four abstract adjectives (e.g., 'blonde', 'round', 'contagious', 'innocent'); and four concrete and four abstract verbs (e.g., to burn, to join, to frustrate, to think). Scoring on adult's definitions, according to Benelli et al., was determined in terms of increments of morphosyntactic

complexity (e.g., a preposition added to a single word; the introduction of non-conjugated verbs; the use of conjugated verbs; etc.).

However, researchers coded content aspects ("categorical terms and discriminating specification") together with the formal aspects in the same categories, therefore, a definition with an appropriate linguistic structure such as 'to frustrate means to hit somebody with a whip' would not be in their higher level of syntactic complexity because the semantic aspects are not correct. Results showed that only an 8% of the definitions of LE adults were metalinguistic (i.e. definitional copula + categorical term + discriminating specification with no repetition of the stimulus word), while the percentage of metalinguistic definitions for HE adults reached 30%. An interesting finding is that level 4 answers (adequate form but inadequate content) were the most frequent definitions in both groups of adults with 63% and 60% for the low and high educational levels, respectively. Additionally, as for the effect of morphological category, the authors found that verbs were easier to define than adjectives and nouns, however, they do not provide any further specification, explanation or interpretation on what it means that "verbs are easier to define than adjectives and nouns". Therefore, from the information provided by the authors we cannot know how morphological category affects nor the syntactic neither the semantic dimension of word definitions. The greatest differences between the two adult groups, according to the authors, emerged for the most difficult type of stimuli: abstract nouns, concrete adjectives and abstract adjectives (they do not explain why they consider these three to be the most difficult type of stimuli, neither is explained how exactly these type of stimuli were defined in terms of their form and content aspects) in which HE adults performed better than LE adults. The authors conclude that providing formal definitions is linked to educational level, as overall, adults with a lower educational level used fewer normative

Aristotelian ("metalinguistic") definitions than the more highly educated adults.

From the revision of previous on adults' definitional abilities some conclusions can be drawn. Firstly, literacy and schooling appear to be highly involved in the development of formal definitional skills. Secondly, following Benelli et al. (2006) findings in relation to the significant differences between LE and HE in the semantic components of definition (categorical term + discriminating specifications), it seems safely to assume that the syntactic dimension of the definition is less permeable to changes as a function of literacy and schooling, compared to the semantic one. Finally, the category noun is the morphological category that strictly follows the formal definitional structure (an X is a Y that Z) and the formal semantic requirements (i.e. inclusion of a superordinate term and 'criterial information' or definitional features).

In order to better support the present study we shall refer also to some relevant results we advanced in section (2.1.4 and 2.1.5) in relation to the effect of morphological category and t level of abstraction of the definiendum.

Firstly, with respect to the category of the word to be defined, Markowitz and Franz (1988) suggest that verbs may have a formal definitional form similar to nouns, but their results for adjectives were not conclusive. Moreover, Marinellie and Johnson (2003) suggest that verb forms appear to be the adult-like form to define adjectives.

Secondly, in relation to level of abstraction of the word to be defined, McGhee-Bidlack (1991) point out that at age 18 concrete nouns are defined mainly in terms of their superordinate term and characteristics (e.g., "A flower is a plant that has colourful petals"), whereas abstract nouns are defined mainly in terms of their characteristics, with their superordinate terms often omitted (e.g., "Freedom means you can do what you want to do"). Similarly, Nippold, Hegel, Sohlberg, & Schwarz (1999) found that adults's definitions reflect higher knowledge of the target word, the superordinate

category term, accurate characteristics of the words (definitional features), and awareness of both literal and figurative interpretations of words.

In sum, there seems to be a lack of agreement as to how morphological category and level of abstraction of the words to be defined affect syntactic and semantic dimensions of adults' word definitions. In order to further explore and shed some light to the adul-like way of defining concrete and abstract nouns, adjectives and verbs, in this study we felt the need to draw a comparison between the two different dimensions of definitions (syntactic and semantic) taking into account both variables: morphological category and level of abstraction of the words.

3.2 Objectives and Hypothesis

Our main goal for this second study, therefore, is to examine the degree to which the morphological category and the level of abstraction of the *definiendum* affect the syntactic and semantic characteristics of the *definiens* adults produce when they are asked to define a word.

Based on prior research (Markowitz & Franz, 1988; Marinellie & Johnson, 2003) we expect to find differences in the syntactic structure of adults' definiens between noun and verb definitions compared to adjective definitions. According to their results, we should expect to find that nouns and verbs are defined through a relative clause, while adjectives are defined through 'verb forms, that is, a complex sentence (e.g., "used to describe exquisite things" for the definiendum *elegant*).

As for the semantic dimension, based on prior research (Marinellie and Johnson**,** 2003) we predict that noun would contain more superordinate terms and more definitional features than definitions of adjectives and verbs.

As regards the level of abstraction of the definiendum, and taking into account previous studies (McGhee-Bidlack, 1991; Nippold, Hegel, Sohlberg, & Schwarz, 1999), we predict that words with a higher level of abstraction would contain less hyperonyms, of less quality and less differential features than words with a low level of abstraction.

3.3 Method

3.3.1 Participants

A total number of 30 adults, 15 men and 15 women (M= 32 years, range 22-38 years) took part in our study. We selected adults with higher education from three different Spanish communities: *Murcia*, *Madrid* and *Comunitat Valenciana*. In the case of the *Comunitat Valenciana*, we only selected three adults who came from a Spanish dominant language context, both in their social environment and at work or university contexts, where the spoken language was Spanish, and *Valencià* was only taught (in the case of university students) as a second language. In order to avoid a potential difference between the adults in the *Comunitat Valenciana* and the adults from the rest of the communities, we added the *community of origin* as an independent variable in our analyses to make sure it would not affect neither the syntactic nor the semantic dimensions of the adults' *definiens*.

3.3.2 Task and materials

The materials and the task for the current study are the same ones used for Study 1.

3.3.3 Procedure

We asked every participant to orally define the 32 words presented in an increasing difficulty order. The researcher read out loud each word in Spanish and asked the adult to provide a definition with the following instruction: *¿Qué es un/a X*? 'what is a/an X?' for nouns and *¿qué es X*? 'what is X?' for adjectives and verbs. We used the same procedure as the one used in Study 1. We interviewed every participant individually for 20 minutes in a quiet room to promote concentration on the task. Once the process of data gathering was completed, we transcribed the interviews of the adults and coded them according to the criteria we presented in Study 1.

3.3.4 Coding Criteria

The coding criteria that we used for this study is the same one for syntactic and semantic dimensions that the coding criteria we used for study 1. A total number of 960 definitions were gathered and their syntactic structure and semantic content was independently analysed. As a result, each definition was coded according to four dimensions: a syntactic dimension, relative to its structure, and three semantic dimensions: *use of the categorical term*, *specificity of the hyperonym* and the *semantic content of the definiens*. The criteria to define these four dimensions were defined in Study 1.

3.3.4.1 Syntactic complexity scale.

The scale of syntactic complexity contained the following levels and structures. See Appendix A2 for a detailed description of the syntactic complexity scale.

1) No answer

Answers consisting on a *frame* or a *don't know* assertion.

2) Pre-sentence structures

Definitions consisting on one of the following structures:

2.1 Noun

2.2 Prepositional phrase

2.3 Adjective phrase

2.4 Determiner phrase without modifiers

2.5 Noun phrase with modifiers

2.6 Determiner phrase with modifiers

2.7 Non-finite verb

2.8 Finite verb

2.9 Final adverbial phrases

2.10 Infinitive final adverbial phrase

2.11 Subjunctive final adverbial phrase

2.12 Final adverbial phrase with a finite verb form

2.13 Quasi-relatives

2.13.1 DP + preposition + infinitive verb form

2.13.2 DP + preposition + que +subjunctive verb form

2.13.3 Relative phrase without antecedent

3) Simple sentence

Definitions consisting on one of the following structures:

3.1 Non-finite simple sentence

3.2 Finite simple sentence

3.3 Non-finite copulative sentence

3.4 Finite copulative sentence

4) Complex sentence

Definitions consisting on one of the following structures:

4.1) Main predicate + final adverbial subordinated sentence

4.2 Adverbial subordinate sentence of time

4.3 Conditional and/or comparative sentence

4.4 Completive subordinate sentence with infinitive

4.5 Complex sentence with subordinate relative clause

4.6 Completive sentence with a finite verb which main predicate does not appear explicit introduced by the nexus of subordination *que*.

5) Relative clause

Definitions consisting on one of the following structures:

5.1 Free oblique/complement relative clause

5.2 Free subject relative clause

5.3 Semi-free subject relative clause

5.4 Semi-free object relative clause

5.5 Subject relative clause

5.6 Object relative clause

5.7 Complement/oblique relative clause

The validation of the syntactic complexity scale was explained in Study 1 (see pp. XX).

3.3.4.2 Semantic Dimension

The categories contained in the ordinal scale for the analysis of the three semantic sub-dimensions that conform the semantic dimension of word definitions were: (1) categorical term; (2) specificity of the hyperonym and (3) semantic content of the definiens. The different semantic sub-dimension scales were described in detail in Study 1 (pp. 14-22).

3.4 Strategy of Analysis

To detect the sources of variance of word definition in adults, we analysed word definitions in a multilevel model. In this model, the ordinal level of each definition in each of the dimensions on which adults' performance was measured was explained by the distance from the *mean* (*var*) (level one); and by the student's community (*level-two* students), the morphological category and the level of abstraction of the *definiendum* (*level-two* words).

According to this multi-level model, the latent variable *word definition performance* was evaluated on two major dimensions: syntactic and semantic, where the semantic dimension was evaluated in three sub-dimensions: categorical term, specificity of the hyperonym and semantic content of the *definiens*. Each of these dimensions was

measured with different ordinal scales detailed in Table 17.

Table 17

Ordinal Scales for Syntactic Dimension and Semantic Sub-Dimensions

Level	Syntactic Complexity	Categorical Term	Specificity of the Hyperonym	Semantic Content
0	No answer	No answer	No answer	No answer
1	Pre-sentence structures	Absence of categorical term	Absence of hyperonym	Absence of semantic content
2	Simple sentence	Relational term	Low specificity	Deixis & tautology
3	Complex Sentence	Hyperonym	Middle specificity	Contextual
4	Relative clause		High specificity	Sindef
5				Definitional features

We evaluated the syntactic and semantic dimensions in two levels, where level one is a definition of a word in an ordinal scale. For level 1, we constructed the *variance* (*var*) within each student and for each word definition, based on the distance of the specific category of definition from the ordinal scale to the mean of the morphological category (i.e. nouns, adjectives, and verbs) performed by the student on each dimension (syntactic and semantic). In other words, the within mean of the student's definition by morphological category was the centre around which we measured the student's performance. The variable *var*, therefore, was calculated for each student separately, around the student's mean score within that dimension for every word, within each morphological category. Altogether, each student had 128 new scores for the variable

var. The variable *var* allowed us to define in which morphological category adults performed more consistently.

On level two we included the independent variables: the students (the community of origin of the adults), and the score of each word in terms of the morphological category and the level of abstraction of the definiendum.

In our multi-level model, we explained each student's word definition by the level-one distance from the mean and the level-two: student's community, morphological category and level of abstraction of the definiendum. Different analyses were used in our multi-level model in order to measure different hypotheses:

1. We used a multilevel ordered logit model and performed a Multilevel Ordinal Logistic Regression analysis to estimate the effect of the level-two IVs: community (at student level) and morphological category and level of abstraction of the definiendum (at word level) on the level of syntactic complexity of the definiens and the semantic complexity of the categorical term, the specificity of the hyperonym, and the semantic content of the definiens. The fact that the model is ordered means that the probability of being in a higher category is cumulative with respect to the probability of being in a lower category.
2. Finally, we calculated the *cumulative probabilities* for the syntactic complexity ordinal scale and for each one of the semantic sub-dimensions. This analysis showed how different characteristics of students and words represented different probabilities to be on a specific category in the syntactic and semantic dimension ordinal scales, and how the cumulative probability varied across different students and words.

We expected an effect of the morphological category and of the level of abstraction of the definiendum on the level of syntactic complexity of the adults' definiens and on the

semantic complexity of the categorical term, the specificity of the hyperonym and the semantic content of the adults' definiens. We do not expect an effect of the independent variable *community of origin* of the adults.

The first part of the results presented here concerns the syntactic complexity of word definitions. Given the fact that the *no answer* was almost non-existent in the adults' definitions (less than 1%) we decided to report the analyses for the syntactic and semantic dimensions including the *don't know* answers. We evaluated the syntactic complexity of the structure of the definiens for each word by level-one distance from the mean (*var*) and level-two observations: students (community or origin) and words (morphological category and level of abstraction of the definiendum).

The second part of the analysis concerns the semantic dimension of word definition performance. We explained the semantic categories of analysis for each sub-dimension (categorical term; specificity of the hyperonym; and semantic content of the definiens) to evaluate semantic complexity for each word by level-one distance from the mean (*var*) and level-two observations regarding students and words.

Finally, we included in one model both syntactic and semantic dimensions to test the correlation between the two parts of the analysis. In this final model we used the semantic categories as the dependent variable and regressed them against the syntactic categories, as level-one variable, and against the level of abstraction of the definiendum, as level-two variable. Here we also controlled by the morphological category of the definiendum. Note that this control was measured by the variance (*var*), and gave us the ability not only to define variance within a student, but also to define variance within a student between the different morphological categories.

3.5 Results

3.5.1 Syntactic Complexity Ordinal Scale

We ran an Ordered Logit Model to evaluate the performance of the adults on the syntactic complexity of the *definiens*' structure. This analysis allowed us to estimate the probability of the definiens to be in one of the following categories of the syntactic complexity ordinal scale: no answer (*don't know* and *frames*), pre-sentence structures, simple sentence, complex sentence, and relative clause.

The dependent variable was the complexity of the syntactic structure the adults used in their definitions, measured with the ordinal scale presented above. The independent variables were measured in two levels: the variance (*var*) at level 1, which varied at the individual level (Student X Word); and at level 2 the community (*bi-lingual* vs. *mono-lingual*), which varied by students; and the morphological category (*nouns*, *adjectives* and *verbs*) and the level of abstraction of the *definiendum* (*low* vs. *high*), which varied by word. Given the fact that the *no answer* was almost non-existent in the adults' definitions (less than 1%) we decided to report the analyses for the syntactic and semantic dimensions including the *don't know* answers. Table 18 below shows the full array of responses for the main effect model including the *don't know* answers.

Table 18

Multilevel Ordinal Logistic Regression. Analysis with Fixed and Random Effects Predicting the Probability of the Complexity of the Syntactic Structure of the Definiens

		Model 3
Fixed effects	Intercept	−4.71***
		(0.36)
	Thold 2	2.66***
		(0.20)
	Thold 3	3.45***
		(0.21)
	Thold 4	4.79***
		(0.22)
L1: Student *word	Student mean variance	0.86***
		(0.07)
L2: Student level	Community	0.38
		(0.22)
L2: Word level	Adjectives vs Names	−0.74
		(0.58)
	Verbs vs Names	1.17*
		(0.48)
	Abstraction	0.02
		(0.17)
Variance components		
Level 2 - students	Student intercept $\sigma_{student}^2$	0.87***
		(0.93)
Level 2 - words	Word intercept σ_{word}^2	0.24***
		(0.49)
ICC students		.20
ICC words		.05
Pseudo R^2		.32

Note. Values enclosed in parentheses represent standard errors (for fixed effects) and standard deviation (for random parameters)
*p<.05 **p<.01 ***p<.001

Table 18 shows that when the distance of the student's score on each word (L1: student mean variance) with respect to the student's mean (b=0.86, p<.001) increases, the probability of being in a lower ordered category also increases, and variability within a student means that events of lower ordered categories are frequent in comparison with the *no answer*. That the probability of being in a lower ordered category is higher arises because adults concentrate their definiens in less categories of response for the syntactic complexity scale, presumably in the higher levels of the syntactic complexity scale. Therefore, if the variability in one student increases, there is a higher probability that that adult is providing a syntactic structure of a lower level in the syntactic complexity scale. At the student level, coming from a monolingual or a bilingual community did not make a difference.

Regarding word level, results showed that the level of abstraction of the definiendum did not affect the category of the syntactic complexity scale into which the student belonged. In contrast, results for the morphological category of the definiendum indicated that the probability of the adults definiens being in a higher ordered category of the syntactic complexity scale was lower for verbs compared to nouns (b=1.17, p<.05). In other words, in terms of their syntactic structure verbs were more difficult to define than nouns. Therefore, adults' noun definiens had a higher probability of being expressed through a syntactic structure allocated in the higher ordered categories of the syntactic complexity scale than verb definiens. The percentage of variance explained by the students was higher in comparison with the percentage of variance explained by the word level (20% and 5%, for students and words, respectively).

3.5.1.1 *Cumulative Probabilities for the Syntactic Complexity Ordinal Scale*

To complete the analysis of the syntactic complexity of definitions we calculated the cumulative probability of the adults' *definiens* being in a certain category level of the syntactic complexity ordinal scale taking into account the *no answer*. These probabilities were calculated for different students, characterized by deviation from the mean, to show how different characteristics of words represented different probabilities for adults' *definiens* to be on a specific category in the syntactic complexity ordinal scale, and how the cumulative probability varied across different words. The probabilities for the *mean* are shown in the first column (noun) of table 3. Given that all continuous variables were centred around the mean, the probability for an average student was related to nouns (zero for adjectives and zero for verbs). By average student we mean: an adult who belongs to a monolingual community and who defines a noun with a middle level of abstraction. The constant shift in these probabilities reflected the effect of the morphological category of the definiendum. The level of abstraction effect was illustrated by the *low* level and the *high* level of abstraction of the *definiendum* (one standard deviation below and above the zero-mean, respectively).

Table 19 presents these cumulative probabilities for the different morphological categories and the level of abstraction of the definiendum. This table (and the rest of the cumulative probabilities tables) express cumulative probabilities and, as such, the percentages for each one of the levels of the syntactic complexity scale accumulate from one category to the next, reaching the 100% at the highest level of the scale. However, in order to simplify the reading of these tables, we present the real mean percentages for each one of the levels of the syntactic complexity scale instead of presenting the cumulative percentage. We followed this same criterion in the presentation of the

cumulative probability tables for the analysis of the semantic dimension of the definition.

Table 19

Predicted Cumulative Probabilities for the Ordered Categories of the Syntactic Complexity of the Definiens

		Morphological Category			Abstraction	
MC	Scale Levels	Nouns	Adj	Verbs	Low	High
Noun	No answer & Frames	1	1	1	1	1
	Pre-sentence	10	5	26	10	11
	Simple Sentence	11	6	18	10	11
	Complex Sentence	30	22	33	30	30
	Relative Clause	48	66	22	49	47
Adj	No answer & Frames				1	2
	Pre-sentence				5	5
	Simple Sentence				5	6
	Complex Sentence				22	22
	Relative Clause				67	65
Verb	No answer & Frames				3	3
	Pre-sentence				26	27
	Simple Sentence				18	18
	Complex Sentence				30	30
	Relative Clause				23	22

Note. The values represent mean percentages for each level of the ordinal scale

Results from table 19 showed that the probability for an average student to answer the question “what is x?” with the highest category of answer in the scale was 48%, which means that a relative clause was the preferred structure for adults to define a noun.

In the case of adjectives, the cumulative probability of being in higher categories was a little higher than it was for nouns and, like in the case for nouns, adjective definitions had a very high probability of being represented with a relative clause structure (66%).

In the case of verbs, the probability to be in the lower categories increased significantly compared to adjectives and nouns, but unlike in the case of nouns and adjectives the complex sentence structure was the preferred structure for adults to provide a verb definiens (30%).

The morphology effect was non-linear yet monotonic. So that adjectives presented higher probabilities for the higher ordered categories, while verbs presented the opposite. That is, the morphological category *verb* increased the probability for the lower ordered categories in the syntactic complexity scale.

The level of abstraction of the definiendum did not seem to affect the cumulative probability of the syntactic complexity of adults’ definiens. Meaning that regardless the level of abstraction of the definiendum, adults provided a relative clause to define nouns (49%, and 48%, for low and high level of abstraction, respectively) and adjectives (67%, and 66%, for low and high level of abstraction, respectively); however, adults provided a complex sentence to define verbs of a low or high level of abstraction equally (30%, and 30%, for low and high level of abstraction, respectively).

These trends provided support to our findings in Table 18, which showed main effects of the morphological category and the level of abstraction of the definiendum.

3.5.2 Semantic Dimension

3.5.2.1 Categorical Term

We ran an ordered logit model to evaluate the performance of the participants on the production of a categorical term in the definiens. This analysis allowed us to estimate the probability of the definiens to be in one of the following categories of the categorical term ordinal scale: no answer (don't know), absence of categorical term, relational term, and hyperonym. The dependent variable was the categorical term the adults used in their definitions, measured on an ordinal scale. The independent variables were measured in two levels: the variance at level 1, which varied at the individual level; and at level 2 the community, which varied by students; and the morphological category and the level of abstraction of the definiendum, which varied by word. Table 20 below shows the full array of responses for the main effect model including the *don't know* answers.

Table 20

Multilevel Ordinal Logistic Regression. Analysis with Fixed and Random Effects Predicting the Probability of the Categorical Term of the Definiens

		Model 3
Fixed effects	Intercept	−7.82***
		(0.56)
	Thold 2	3.51***
		(0.26)
	Thold 3	5.68***
		(0.29)
L1: Student *word	Student mean variance	3.24***
		(0.22)
L2: Student level	Community	1.08
		(0.41)
L2: Word level	Adjectives vs Names	2.77***
		(0.79)
	Verbs vs Names	2.12**
		(0.65)
	Abstraction	0.76**
		(0.24)
Variance components		
Level 2 - students	Student intercept $\sigma_{student}^2$	1.65***
		(1.28)
Level 2 - words	Word intercept σ_{word}^2	1.01***
		(1.01)
ICC students		.28
ICC words		.17
Pseudo R^2		.34

Note. Values enclosed in parentheses represent standard errors (for fixed effects) and standard deviation (for random parameters)

**p<.05 **p<.01 ***p<.001*

Model 3 shows that the distance of the student's score on each word (L1: student mean variance) with respect to the student's mean (b=3.24, p<.001) tells us that when this distance increases, the probability of being in a lower ordered category also increases, and variability within a student means that events of lower categories are frequent in comparison with no answer and with the absence of categorical term.

At the student level, coming from a monolingual or a bilingual community did not make a difference.

At the word level, results showed that the higher the level of abstraction of the words the lower the category in the categorical term scale into which the student belonged (b=0.76, p<.01) That is, words with a higher level of abstraction show cases of responses placed in the lower levels of the categorical term ordinal scale (relational terms). Results for the morphological category showed that the probability of being in a lower ordered category was higher for adjectives and verbs, compared to nouns (b=2.77 p<.001; b=2.12, p<.01, for adjectives and verbs, respectively). In other words, in terms of the use of categorical terms, adjectives and verbs were more difficult to define, than nouns. Therefore, the definition of a noun had a higher probability to contain higher ordered categories for the categorical term (i.e., an hyperonym or a relational term) than the definition of and adjective or a verb. The percentage of variance explained by the students was higher in comparison with the percentage of variance explained by the word level (28% and 17%, for students and words, respectively).

3.5.2.1.1 Cumulative Probabilities

To complete the analysis of the use of categorical term in definitions we calculated the cumulative probability of the adults' definiens being in a certain category level of the categorical term ordinal scale taking into account the *no answer*. These probabilities were calculated for different students characterized by deviation from the mean to show how different characteristics of words represented different probabilities for adults' definiens to be on a specific category in the categorical term ordinal scale, and how the cumulative probability varied across different words. The probabilities for the mean are shown in the first column (noun). Given that all continuous variables were centred around the mean, the probability for an average student was related to nouns. The constant shift in these probabilities reflected the effect of the morphological category of the definiendum. The level of abstraction effect was illustrated by the low and high level of abstraction of the definiendum. Table 21 presents these cumulative probabilities for the different morphological categories and the level of abstraction of the definiendum.

Table 21

Predicted Cumulative Probabilities for the Ordered Categories of the Categorical Term of the Definiens

		Morphological Category			Abstraction	
MC	Scale Levels	Nouns	Adj	Verbs	Low	High
Noun	No Answer	—	—	—	—	—
	Absence of CT	1	17	10	1	3
	Relational Term	9	48	39	4	19
	Hypernym	90	35	51	96	77
Adj	No Answer				—	1
	Absence of CT				8	34
	Relational Term				35	47
	Hypernym				57	18
Verb	No Answer				—	1
	Absence of CT				4	21
	Relational Term				24	49
	Hypernym				72	29

Note. The values represent mean percentages for each level of the ordinal scale
Dashes indicate lack of answers for that level of the ordinal scale.

Results from table 21 showed that the cumulative probability for an average student to answer the question "what is x?" including a categorical term placed in the higher categories of the categorical term ordinal scale (relational term and hyperonym) was 98.7%. This meant that the definition of an average student for a noun had a very high probability of including a hyperonym (89.6%). In the case of adjectives, the cumulative probability of being in higher categories was a little lower than it was for nouns (82.3%); however, unlike in the case for nouns, definitions for adjectives had a very high probability of including a relational term (47,4%). In the case of verbs, the cumulative probability for the higher categories was 89.9%, being the hyperonym, like in the case of nouns, the one with the higher percentage 50.7%.

Finally**,** the level of abstraction of the definiendum also affected the cumulative probability of the categorical term of adults' definiens. Words with a high level of abstraction presented higher probabilities for a lower ordered category. When adjectives and verbs had a high level of abstraction, adults tended to respond the question "what is x?" with a relational term (47.3%, and 49%, for adjectives and verbs, respectively); while definitions for nouns with a high level of abstraction had a very high probability of including a hyperonym (77.3%). However, when words had a low level of abstraction, there was a higher probability for hyperonyms to be included as a categorical term in the definition (95.6%; 57.3%; and 72.1%, for nouns, adjectives and verbs, respectively). These trends provided support to our earlier findings of Table 20 which showed main effects of the morphological category and the level of abstraction of the definiendum.

3.5.2.2 Specificity of the Hyperonym

We ran an Ordered Logit Model to evaluate the performance of the participants on the specificity of the hyperonym the adults produced in their definiens. This analysis allowed us to estimate the probability of the definiens to be in one of the following categories of the specificity of the hyperonym ordinal scale: no answer (don't know), absence of hyperonym, low specificity, middle specificity and high specificity. The dependent variable was the specificity of the hyperonym that adults used in their definitions, measured on an ordinal scale. The independent variables were measured in two levels: the variance at level 1, which varied at the individual level; and at level 2, the community, which vary by students; and the morphological category and the level of abstraction of the definiendum, which varied by word. Table 22 below shows the full array of responses for the main effect model including the *don't know* answers.

Table 22

Multilevel Ordinal Logistic Regression. Analysis with Fixed and Random Effects Predicting the Probability of the Level of Specificity of the Hyperonym

		Model 3
Fixed effects	Intercept	−6.43***
		(0.50)
	Thold 2	4.91***
		(0.27)
	Thold 3	5.50***
		(0.28)
	Thold 4	6.11***
		(0.28)
L1: Student *word	Student mean variance	0.23
		(0.12)
L2: Student level	Community	0.93
		(0.40)
L2: Word level	Adjectives vs Names	2.45***
		(0.70)
	Verbs vs Names	0.93
		(0.56)
	Abstraction	0.88***
		(0.21)
Variance components		
Level 2 - students	Student intercept $\sigma_{student}^2$	1.23***
		(1.11)
Level 2 - words	Word intercept σ_{word}^2	1.01***
		(1.00)
ICC students		.22
ICC words		.18
Pseudo R^2		.44

Note. Values enclosed in parentheses represent standard errors (for fixed effects) and standard deviation (for random parameters)
*p<.05 **p<.01 ***p<.001

Results from Table 22 revealed that, at the student level, coming from a monolingual or a bilingual community did not make a difference in the specificity of the hyperonym adults included in their definitions.

As for word level, results showed that the higher the level of abstraction of the definiendum, the lower the category in the scale into which the student belonged ($b=0.88$, $p<.001$), that is, words with a higher level of abstraction showed cases of responses placed in the lower categories of the specificity of the hyperonym scale. Regarding the morphological category of the definiendum, table 6 showed that adjectives had a lower probability, compared to nouns, to be defined with a high specificity hyperonym. Therefore, when the morphological category changed from noun to adjective ($b=2.45$ $p<.001$) the probability of being in a lower ordered category on the specificity of the hyperonym scale was higher for adjectives compared to nouns. The table showed that the percentage of variance explained by the student level was higher in comparison with the percentage of variance explained by the word level (22% and 18% for students and words, respectively).

3.5.2.2.1 Cumulative Probabilities

To complete the analysis of the specificity of the hyperonym of definitions we calculated the cumulative probability of the adults' definiens being in a certain category of the specificity of the hyperonym ordinal scale taking into account the *no answer*. These probabilities were calculated for different students, characterized by deviation from the mean, to show how different characteristics of words represented different probabilities for adults' definiens to be on a specific category in the specificity of the hyperonym ordinal scale, and how the cumulative probability varied across different words. The probabilities for the mean are shown in the first column (noun) of table 23.

Given that all continuous variables were centred around the mean, the probability for an average student was related to nouns. The constant shift in these probabilities reflected the effect of the morphological category of the definiendum. The effect of the level of abstraction of the definiendum was illustrated by the low and high level of abstraction. Table 23 presents these cumulative probabilities for the different morphological categories and the level of abstraction of the definiendum.

Table 23

Predicted Cumulative Probabilities for the Ordered Categories of the Level of Specificity of the Hyperonym

		Morphological Category			Abstraction	
MC	Scale Levels	Nouns	Adj	Verbs	Low	High
Noun	No answer	—	2	—	—	—
	Absence of Hyperonym	18	70	35	7	39
	Low Specificity	10	10	14	5	15
	Middle Specificity	14	7	16	8	14
	High Specificity	58	11	35	80	32
Adj	No answer				—	5
	Absence of Hyperonym				46	83
	Low Specificity				15	5
	Middle Specificity				13	3
	High Specificity				26	4
Verb	No answer				0	1
	Absence of Hyperonym				16	61
	Low Specificity				10	13
	Middle Specificity				13	9
	High Specificity				61	16

Note. The values represent mean percentages for each level of the ordinal scale
Dashes indicate lack of answers for that level of the ordinal scale.

Results from Table 23 showed that, for an average student, the cumulative probability of his definiens containing a hyperonym with either one of the three levels of specificity was very high (10.4%, 13.6%, and 57.9%, for low, middle, and high level of specificity, respectively). And reversely, the cumulative probability for adjective definiens not containing a hyperonym was very high (70%) compared to the probability of including a hyperonym with either one of the three levels of specificity (10.4%, 7.2%, and 10.6%, for low, middle, and high level of specificity, respectively). As shown in the analysis of the categorical term of definition, adults' definiens include a relational term to define adjectives instead of hyperonyms, fact that explains why the percentage of absence of hyperonym in table 23 is 70% for this morphological category. In the case of verbs, the cumulative probability was divided into two opposite categories, the absence of a hyperonym (35.4%) and the use of a hyperonym with a high level of specificity (35.2%) were the two categories bearing the higher percentage. We know, from the analysis of the categorical term of the definiens that adults include a hyperonym when they define verbs, and according to the results of table 23 this hyperonym would be one with the highest level of specificity. But, as table 20 showed, adults' definiens also presented a high probability to include a relational term (39%), this result would explain why the absence of hyperonym in table 23 is of 35%.

Finally, the level of abstraction of the words also affected the cumulative probability of the specificity of the hyperonym of adults' definiens. Words with a high level of abstraction increased the probability for the lower ordered categories, 39.1% probability of lower level categories for nouns with a high level of abstraction versus 7.1% probability of the same categories for nouns with a low level of abstraction. It is also consistent for adjectives and verbs that words with a high level of abstraction will show up on lower ordered categories (88.2% probability of lower level categories for

adjectives with a high level of abstraction versus 46.7% probability of the same categories for adjectives with a low level of abstraction; and 61.9% probability of lower level categories for verbs with a high level of abstraction versus 16% probability of the same categories for verbs with a low level of abstraction). When adults were asked to define a word with a high level of abstraction, they tended not to include a hyperonym (39%, 83%, and 61%, for absence of hyperonym, for nouns, adjectives and verbs, respectively).

Words with a low level of abstraction increased the probability of higher ordered categories. When nouns and verbs had a low level of abstraction, the question "what is x?" tended to be responded with a hyperonym of a high level of specificity (80%, and 61.1%, for nouns and verbs, respectively); while definitions for adjectives with a low level of abstraction had a very high probability of not including a hyperonym (46.1%). These trends support our earlier findings in table 22, which showed main effects of the morphological category and the level of abstraction of the definiendum.

3.5.2.3 Semantic Content of the Definiens

We ran an Ordered Logit Model to evaluate the performance of the participants on the production of semantic content in the definiens. This analysis allowed us to estimate the probability of the definiens to be in one of the following categories of the semantic content ordinal scale: no answer (don't know), absence of semantic content, deixis and/or tautology, contextual, Sindef (synonym, descriptive and functional) and definitional features.

The dependent variable was the semantic content the adults used in their definiens, measured on an ordinal scale. The independent variables were measured in two levels: the variance at level 1, which varied at the individual level; and at level 2, the community, which varied by students; and the morphological category and the level of abstraction of the definiendum, which varied by word. Table 24 below shows the full array of responses for the main effect model including the *don't know* answers.

Table 24

Multilevel Ordinal Logistic Regression. Analysis with Fixed and Random Effects Predicting the Probability of the Semantic Content of the Definiens

		Model 3
Fixed effects	Intercept	−5.71***
		(0.51)
	Thold 2	1.90***
		(0.20)
	Thold 3	2.28***
		(0.21)
	Thold 4	3.81***
		(0.23)
	Thold 5	6.34***
		(0.26)
L1: Student *word	Student mean variance	0.64***
		(0.06)
L2: Student level	Community	1.05
		(0.44)
L2: Word level	Adjectives vs Names	−0.16
		(0.74)
	Verbs vs Names	−0.09
		(0.62)
	Abstraction	0.56*
		(0.23)
Variance components		
Level 2 - students	Student intercept $\sigma_{student}^2$	1.54***
		(1.24)
Level 2 - words	Word intercept σ_{word}^2	1.24***
		(1.12)
ICC students		.25
ICC words		.20
Pseudo R^2		.45

Note. Values enclosed in parentheses represent standard errors (for fixed effects) and standard deviation (for random parameters)
*p<.05 **p<.01 ***p<.001

Results for the main effect model in table 24 revealed that when the distance of the student's score on each word with respect to the student's mean (b=0.64, p<.001) increased, the probability of being in a lower ordered category also increased, and variability within a student meant that events of lower categories were frequent in comparison with the *no answer* and with the absence of semantic content.

At the student level, coming from a monolingual or a bilingual community did not make a difference in the semantic content of adults' definiens. Regarding word level, results from table 8 showed that the higher the level of abstraction of the definiendum the lower the category in the semantic content of the definiens scale into which the student belongs (b=0.56, p<.05). The morphological category of the *definiendum* did not make a significant difference when paired with the variable level of abstraction of the word.

Finally, the percentage of variance explained by the student level was a little higher in comparison with the percentage of variance explained by the word level (25% and 20% for students and words, respectively).

3.5.2.3.1 Cumulative Probabilities

To complete the analysis of the semantic content of the definiens we calculated the cumulative probability of the adults' definiens being in a certain category level of the semantic content of the definiens ordinal scale taking into account the *no answer*. These probabilities were calculated for different students characterized by deviation from the mean to show how different characteristics of words represented different probabilities for adults' definiens to be on a specific category in the semantic content ordinal scale, and how the cumulative probability varied across different words. The probabilities for the mean are shown in the first column (noun) of table 25. Given that all continuous variables were centred around the mean, the probability for an average student was related to nouns. The constant shift in these probabilities reflected the effect of the

morphological category of the definiendum. The level of abstraction effect was illustrated by the low level and the high level of abstraction of the definiendum. Table 25 presents these cumulative probabilities for the different morphological categories and the level of abstraction of the definiendum.

Table 25

Predicted Cumulative Probabilities for the Ordered Categories of the Semantic Content of the Definiens

		Morphological Category			Abstraction	
MC	Scale Levels	Nouns	Adj	Verbs	Low	High
Noun	No answer	—	—	—	—	—
	Absence of SMC	2	2	2	1	4
	Deixis & Tautology	1	1	1	—	2
	Contextual	10	9	9	5	17
	Sindef	52	50	51	42	56
	Definitional Features	35	38	37	52	21
Adj	No answer				—	—
	Absence of SMC				—	3
	Deixis & Tautology				—	2
	Contextual				5	15
	Sindef				39	56
	Definitional Features				56	24
Verb	No answer				—	—
	Absence of SMC				1	3
	Deixis & Tautology				—	2
	Contextual				5	16
	Sindef				40	56
	Definitional Features				54	23

Note. The values represent mean percentages for each level of the ordinal scale
Dashes indicate lack of answers for that level of the ordinal scale.

Results from table 25 showed that the cumulative probability for an average student to answer the question "what is x?" including semantic content in the definiens expressed through one of the higher ordered categories of the semantic content ordinal scale (*sindef* and definitional features) was of 86.9%. And the category *sindef* (52.2%) was the one with the highest probability among the higher ordered categories, which means that adults' definiens include semantic content through: a synonym; expressing descriptive characteristics of the definiendum; or expressing the function of the definiendum. In the case of adjectives, the cumulative probability of being in the higher ordered categories of the semantic content was a little higher than it was for nouns (88.6%). But, like in the case of nouns, adults' adjective definitions presented a high probability of expressing semantic content through a synonym, definitional features or functional characteristics (50.2%). In the case of verbs, the cumulative probability of being in the higher ordered categories was of 87.9%, being *sindef* the category with the highest probability to express semantic content (51.1%). These results illustrate that the morphological category of the definiendum did not affect the cumulative probability for the semantic content of the definiens, as the category level *sindef* was the level with the highest probability to express the semantic content of adults' definiens for the three different morphological categories.

Finally, the level of abstraction of the definiendum also affected the cumulative probability for the semantic content of the definiens. Words with a high level of abstraction increased the probability for the lower ordered categories, 23% probability of lower level categories for words with a high level of abstraction versus 7.1% probability of the same categories for words with a low level of abstraction. On the contrary, words with a low level of abstraction increased the probability for higher ordered categories, 92.9% probability of higher level categories for words with a low

level of abstraction versus 77% at the same levels for words with a high level of abstraction. It was also consistent for adjectives and verbs that a high level of abstraction increased the probability of lower ordered categories of the semantic conent of the definiens, 20.3% probability of lower level categories for adjectives with a high level of abstraction versus 6% probability of the same categories for adjectives with a low level of abstraction; and 21.4% probability of lower level categories for verbs with a high level of abstraction versus 6.5% probability of the same categories for verbs with a low level of abstraction. While low level of abstraction increased the probability of higher ordered categories, 93.9% probability of higher ordered categories for adjectives with a low level of abstraction versus 79.7% probability for the same categories for adjectives with a high level of abstraction; and 93.5% probability of higher ordered categories for verbs with a low level of abstraction versus 78.6% probability for the same categories for verbs with a high level of abstraction.

When words had a high level of abstraction, the question "what is x?" had a higher probability to be responded with the *sindef* category (55.9%; 55.8%; and 55.9%, for nouns, adjectives, and verbs, respectively). However, when words had a low level of abstraction, there was a higher probability for the semantic content to be expressed through definitional features (51.3%; 55.3%; and 53.7%, for nouns, adjectives, and verbs, respectively).

These trends support our earlier findings of table 24, which showed main effects of the level of abstraction of the definiendum.

3.5.3 Syntactic-Semantic Dimension

In the previous sections of our analysis we looked, separately, at the syntactic complexity; the categorical term; the specificity of the hyperonym; and the semantic content of noun, adjective and verb definitions. In this part of the analysis we were interested at looking whether an increase in the syntactic complexity of the adults' definiens had a possible effect on the three semantic sub-dimensions of the *word definition performance*, that is, if an increase in the syntactic complexity of the definiens increased the probability of the categorical term, the specificity of the hyperonym and the semantic content of the definiens to be in higher ordered categories in the respective semantic scales we elaborated to analyse the semantic dimension of definitions.

For this last part of the analysis, we included in one model both syntactic and semantic dimensions of our definitions to test the correlation between the two parts of the analysis. We ran an Ordered Logit Model using the semantic ordinal scales of the semantic sub-dimensions as the dependent variables and regressed them against the syntactic categories of the syntax complexity scale as level-one independent variable (P1 was taken as a continuous variable). We controlled by the rest of the independent variables: the student's community; the morphological category and the level of abstraction of the definiendum as level two variables. We also controlled by the variance at level 1 (*var*), what gave us the ability not only to define the variance within a student, but also to define the variance within a student for each one of the different morphological categories.

We present the results for the syntactic-semantic dimensions in one table explaining the effect of the syntactic complexity of the structure of the definiens on one of the three sub-dimensions of the semantic dimension of the definition for the main effect model.

The first one, table C.1, presents the sub-dimension *categorical term* as the dependent variable (without the *don't know* answers) which was measured on an ordinal scale with the following values: absence of categorical term, relational term, and hyperonym. The independent variable was P1 (at level 1, syntax complexity scale taken as a continuous variable). The second one, C.2, presents the sub-dimension *specificity of the hyperonym* as the dependent variable (without the *don't know* answers), which was measured on an ordinal scale with the following values: absence of hyperonym, low specificity, middle specificity, and high specificity. The independent variable was P1 (at level 1, syntax complexity scale taken as a continuous variable). Finally, the last table, table 26, presents the sub-dimension *semantic content of the definiens* as the dependent variable (without the *don't know* answers) which was measured on an ordinal scale with the following values: absence of semantic content, deixis and/or tautology, contextual, Sindef, and definitional features. The independent variable was P1 (at level 1, syntax complexity scale taken as a continuous variable). Table 26 is the only one presented in this section. Tables C.1 and C.2 are not included in this section as results from both tables showed that the syntactic complexity did not affect neither the categorical term nor the specificity of the hyperonym of adults' definiens. An increase in the complexity of the syntactic structure of adults' definiens did not entail an increase in the probability of adults' definiens to be in a higher ordered category neither for the categorical term of the definiens nor for the specificity of the hyperonym. See Appendix C for Tables C.1 and C.2.

Table 26

Multilevel Ordinal Logistic Regression. Analysis with Fixed and Random Effects Predicting the Probability of the Syntactic Complexity on the Semantic Content of the Definiens

		Model 3
Fixed effects	Intercept	−3.92***
		(0.47)
	Thold 2	0.40***
		(0.08)
	Thold 3	1.96***
		(0.13)
	Thold 4	4.49***
		(0.18)
L1: Student *word	P1 Intercept	−0.08*
		(0.04)
L1: Student *word	Student mean variance	0.41***
		(0.07)
L2: Student level	Community	1.05
		(0.44)
L2: Word level	Adjectives vs Names	−0.39
		(0.70)
	Verbs vs Names	−0.25
		(0.58)
	Abstraction	0.52*
		(0.21)
Variance components		
Level 2 - students	Student intercept $\sigma_{student}^2$	1.33***
		(1.16)
Level 2 - words	Word intercept σ_{word}^2	1.27***
		(1.13)
ICC students		.23
ICC words		.22
Pseudo R^2		.18

Note. Values enclosed in parentheses represent standard errors (for fixed effects) and standard deviation (for random parameters)
*p<.05 **p<.01 ***p<.001

Model 3 in table 26 showed that the syntactic complexity affected the semantic content of adults' definiens. An increase in the complexity of the syntactic structures the adults used in their definiens brought an increase in the probability of adults' definiens to be in a higher ordered category for the semantic content of the definiens. If we take a look at the syntactic complexity coefficient (P1 Intercept) ($b=-0.08$ $p<.05$) we can see that when the syntactic complexity of nouns, verbs and adjectives increased, the probability for the semantic content of the definiens to be in a higher ordered category of response also increased. That is, an increase in the syntactic complexity of noun, verb and adjective definitions entailed an increase in the semantic complexity of the semantic content of adults' definiens.

Summary of Analyses and Results for Study 2

Analysis Performed	Objective of the Analysis	Obtained Results
Multilevel ordinal logistic regression	Predicting the probability of a syntactic structure in the definition	• No effect of the level of abstraction • Verbs more difficult to define than nouns • Students explain higher percentage or variance than words.

Cumulative Probabilities for Syntactic Complexity	Calculate the probability of answer for each level of the scale	• Morphological Category:
		  o Relative Clause for N and A. Complex Sentence for V
		• Abstraction:
		  o Low: Relative Clause for N and A. Complex Sentence for V
		  o High: Relative Clause for N and A. Complex Sentence for V

Multilevel ordinal logistic regression	Predicting the probability of the categorical term	• Higher abstraction brings lower level in the categorical term scale. • Adjectives and verbs more difficult to define than nouns. • Students explain higher percentage of variance than words.

Cumulative Probabilities for Categorical Term	Calculate the probability of answer for each level of the scale	• Morphological Category:
		  o Hyperonym for N and V. Relational Term for A
		• Abstraction:
		  o Low: Hyperonym for N, A, and V
		  o High: Hyperonym for N. Relational Terms for A and V

Multilevel ordinal logistic regression	Predicting the probability of the specificity of the hyperonym	• Higher abstraction brings lower level in the specificity of the hyperonym scale. • Adjectives more difficult to define than nouns. • Students explain higher percentage of variance than words.

Summary of Analyses and Results for Study 2

Analysis Performed	Objective of the Analysis	Obtained Results

Cumulative Probabilities for Specificity of the Hyperonym	Calculate the probability of answer for each level of the scale	• Morphological Category:
		  o High Specificity Hyperonym for N. Absence of Hyperonym for A. Verbs equal percentage of Absence of Hyperonym and High Specificity Hyperonym
		• Abstraction:
		  o Low: High Specificity Hyperonym for N and V. Absence of Hyperonym for A.
		  o High: Absence of Hyperonym for N (39%), A and V.

Multilevel ordinal logistic regression	Predicting the probability of semantic content of the *definiens*	• Higher abstraction brings lower levels in the semantic content scale. • No effect of the morphological category • Students explain higher percentage of variance than words.

Cumulative Probabilities for Semantic Content of the *Definiens*	Calculate the probability of answer for each level of the scale	• Morphological Category:
		  o Sindef for N, A and V.
		• Abstraction:
		  o Low: Definitional Features for N, A and V
		  o High: Sindef for N, A and V

Multilevel ordinal logistic regression	Predicting the effect of syntactic complexity on the categorical term, on the specificity of the hyperonym and on the semantic content of the *definiens*	• An increase in the syntactic complexity of nouns, adjectives and verbs increases the probability of the semantic content to be in a higher ordered category of response. Therefore, an increase in the complexity of syntactic structures brings an increase in the complexity of the semantic content of the *definiens*.

3.6 Discussion

The primary purpose of this study was to explore the definitional style of Spanish adults in both syntactic and semantic dimensions of concrete and abstract noun, adjective and verb definitions. We remind here the specific questions for the independent variables related to the characteristics of the words and the characteristics of the students for this study. Regarding the morphological category of the definiendum, our specific questions were: (a) how do Spanish adults' noun and adjective definitions compare in terms of syntactic dimension? (b) how do Spanish adults' noun and verb definitions compare in terms of syntactic dimension? (c) how do Spanish adults' noun and adjective definitions compare in terms of semantic dimension? (d) how do Spanish adults' noun and verb definitions compare in terms of semantic dimension? As regards the variable level of abstraction of the definiendum, our specific question for this first study was: how do Spanish adults' syntactic and semantic dimensions of noun, adjective and verb definitions compare in terms of the level of abstraction of the definiendum?

As predicted, this study showed that there was a generalized effect of the morphological category of the *definiendum* on the syntactic and the semantic dimension of the definition, except for the semantic content of the *definiens*. However, against expectations, the impact of the level of abstraction of the *definiendum* was more restricted. Level of abstraction only explained significantly the differences in all the components of the semantic dimension. Finally, this study showed that the level of syntactic complexity of the definiens was directly related to one of the three main aspects considered in the semantic dimension of the definition. In the following lines we elaborate on each of these findings.

Regarding the effect of the morphological category of the *definiendum*, we found that although the morphological category of the definiendum affects both syntactic and

semantic dimensions of the definition, its effect on the semantic dimension differs from the effect on the syntactic dimension. On one of the sub-dimensions of the semantic dimension, precisely, semantic content, the morphological category has no effect, but the implications of this result would be explained shortly. First of all, regarding the effect of the morphological category of the definiendum on the syntactic dimension, results showed that the morphological category of the *definiendum* affects the complexity of the syntactic structures with which adults define nouns, adjectives and verbs. Nouns and adjective *definiens* are defined through a relative clause, while verbs *definiens* are defined through a complex sentence. In order to define an adjective, a noun semantically and ontologically related to the adjective must be used first, that is, a relational term, as the results for this study show. Defining relative clauses are located at a lexical level, while complex sentences are located at the predicate level. Even though a relative clause could have a sentence as its antecedent, (for example: *improvisó un discurso brillantísimo*, *lo cual provocó general admiración* 'he improvised a brilliant discourse, which caused the admiration of the public'), this is the case only for non-defining relative clauses. However, defining relative clauses cannot have a sentence as an antecedent, and in the context of a definition expected relative clauses are always defining.

To explain why verb definiendums are defined with a complex sentence, a close examination of the results for verbs revealed that when adults defined a verb with a low level of abstraction, they provided another verb, which in many cases may contain the definiendum due to its level of generality, therefore, adults provide hyperonyms in the form of more-general-than-the-definiendum verbs to define verbs with a low level of abstraction (for example a verb like *irse* 'to go' provided as an hyperonym for *emigrar* 'to emigrate'). However, when the level of abstraction of the verb definiendum was

high, adults provided, as categorical term, another verb that could be considered as a synonym of the definiendum and which is semantically related to the definiendum, but since these verbs are not more general than the definiendum they were not coded as hyperonyms but as relational terms. This could be the reason behind the results for verbs, that is, verbs are not defined with a relative clause structure, because although adults defined verbs with hyperonyms, these hyperonyms are not nominal, but verbal, and therefore, they demand a completive sentence (introduced by *que* 'that'). This could be a completive sentence with a level of subordination in which we could find a relative clause that would have a NP included in the hypotaxis of the main predicate as antecedent. While to define a noun or an adjective the categorical term used is an hyperonym or a relational term (i.e. another noun semantically related to the definiendum), these hyperonyms or relational terms demand a relative clause structure.

The morphological category of the *definiendum* also affects the semantic dimension of the definition. Regarding the categorical term, the cumulative probabilities analysis for the morphological category alone showed that nouns and verbs contain an hyperonym as a categorical term, while adjectives contain a relational term. However, our regression analyses showed that adults define adjectives and verbs with a lower ordered category in the scale, compared to nouns. This was only true when we measured the effect of the morphological category and the level of abstraction of the *definiendum* together. Adjectives and verbs with a high level of abstraction contain relational terms while nouns contain hyperonyms. Therefore, the morphological category alone can only explain the differences between categorical terms for adjectives and nouns, but in order to understand the differences between verbs and nouns the level of abstraction of the *definiendum*, together with the morphological category, must be taken into account too.

In relation to the level of specificity of the hyperonym, our regression analyses showed that adults define adjectives with a lower ordered category in the scale compared to nouns. We found that nouns and verbs are defined with a high specificity hyperonym, while adjectives are not defined with a hyperonym, but with a relational term. Unlike the results for the categorical term, the variable *morphological category* alone can explain the differences between adjectives and nouns in the level of specificity of the hyperonym. But, the level of abstraction of the definiendum does change the outcome of the morphological category for the level of specificity of hyperonyms too.

Contrary to our prediction, the morphological category of the word does not affect the semantic content of adults' *definiens*. Yet again, it is the level of abstraction of the *definiendum* the variable that generates changes in the outcome results for the semantic content of the *definiens*. Adults express the semantic content of noun, adjective and verb definitions through *definitional features*, only when the level of abstraction of the *definiendum* is low. As the level of abstraction of the word increases, a change is produced in the way that adults express the semantic content of definitions by means of using either a synonym, descriptive characteristics or functional features (*sindef*). These results for the semantic dimension of the definition indicate another important conclusion of our study, that is, the effect of the morphological category in the semantic dimension of the definition is guided or mediated by the effect of the level of abstraction of the *definiendum*, as the latter increases its degree of abstraction it modifies the outcome of the morphological category. And nouns seem to be the less permeable category to the changes in the level of abstraction of the word, except in the case of semantic content, in which the noun is likewise affected (as adjectives and verbs are) by the level of abstraction of the definiendum.

Contrary to our predictions the level of abstraction of the *definiendum* only affects the semantic dimension of word definition, that is, the categorical term, the level of specificity of the hyperonym and the semantic content of noun, adjective and verb definitions. That the effect of this variable is restricted to the semantic dimension does not mean that it should be taken lightly. The level of abstraction is key in explaining the differences in the categorical term and in the semantic content of the definiens, as the morphological category alone can only account for the differences in the level of specificity of the hyperonym. Furthermore, as we explained, the level of abstraction of the *definiendum* guides the effect of the morphological category, as an increase in the level of abstraction of a definiendum always modifies the results of the effect of the morphological category on the semantic dimension of word definition. Therefore, the differences in the semantic dimension of the definition can only be explained taking into account both variables of word complexity: the morphological category and the level of abstraction of the definiendum. As a result, the level of abstraction of the *definiendum* is a key component of the semantic dimension of the word. The results of our study indicate that it is much easier to locate a *definiendum* into a taxonomical category when this *definiendum* has a low level of abstraction, and therefore, the relationship between form-meaning is forward/direct. As the level of abstraction of the *definiendum* increases, the relationship between form and meaning is less forward, augmenting, therefore, the complexity of the process of classifying the *definiendum* into a taxonomical category as well as identifying the definitional features specific of that *definiendum*.

The fact that the level of abstraction of the word does not affect the syntactic dimension of adults' definitions may be explained by adults' vaster world knowledge. The combinatorial possibilities for the syntactic dimension are much more reduced than the

combinational possibilities for the semantic dimension. The semantic dimension of the definition presents broader paradigmatic options from which the speakers may choose in order to classify the definiendum in a taxonomical category and to establish the definitional features that differentiates the definiendum form the other co-hyponyms under the same taxonomical category.

As illustration take the following paradigmatic example of the verb 'to emigrate'. An adult speaker would have multiple options for classifying the verb under a taxonomical category, options such as: *palabra* 'word', *verbo* 'verb', *acción* 'action', or even synonyms semantically related like *dejar* 'to leave', *abandonar* 'to abandon', *irse* 'to go', *ausentarse* 'to be absent' or *cambiar* 'to change', among others. Likewise, among the definitional features that could be attributed to the verb 'to emigrate' we could find the following ones: *por exigencias de la alimentación o de la reproducción* 'for food or reproduction needs'; *para buscar mejores medios de vida* 'to find better means to survive'; *para hacer determinadas faenas o trabajos en otro país* 'for developing specific jobs abroad/ or in a country different from the one of origin'; *con el propósito de establecerse en otro país extranjero* 'with the purpose of establishing themselves in a foreign country'; or *para buscar una vida major que la que se tiene en el propio país* 'to find a better way of life than the one you have in your homeland'. The previous examples of definitional features have been taken from the RAE, and the definitional features illustrate the function, purpose or objective by which the action indicated by the verb is carried out. However, the options of syntactic structures available for the speaker to choose would be restricted to a relative clause, in the case of nouns and adjectives, or to a complex sentence in the case of verbs, which will include, in turn, an embedded relative clause. The syntactic options are generally more restricted than the semantic ones, and require less knowledge of the world. Results for study 1 showed that all levels

of complexity of the syntactic structure of the definition are already available for children, that could also explain why the level of abstraction would cause less variation in the complexity of the syntactic structures of adults' definitions. While since adults have a higher knowledge of the word, and therefore, are aware of the different paradigmatic possibilities to choose from to categorize the word under a hyperonym and to provide the definition with definitional features, this would allow the level of abstraction of the words to be defined to have a higher effect in the semantic dimension of the definition.

Regarding the effect of the syntactic complexity on the semantic dimension of the definition, our study revealed that the syntactic complexity of the structure of the definition does not affect neither the categorical term nor the specificity of the superordinate term. However, an increase in the complexity of the syntactic structure of the definition enables an increase only in one of the sub-dimensions of the semantic dimension, specifically, in the complexity of the semantic content of the definition. Since the semantic content of definitions is expressed through a clause or a proposition, an increase in the syntactic complexity of this proposition would facilitate expressing semantic content in a more complex way, adding embedded content, making longer sentences and with more embedding.

Finally, the last result that offers our study has to do with the percentage of variance explained by the characteristics of the words and by the characteristics of the students: the characteristics of the students are more relevant than the characteristics of the words in order to explain the differences in word definition. Adults have had a lot of experience with the genre of definitions not only because they have more experience with language, but because they have encountered word definitions through their

schooling and academic years, and through their experience with the written modality. As Tolchinsky (2004, book chapter) points out:

> "later language development is geared for two apparently opposing needs: appropriateness and divergence. By divergence I mean the tendency of language to become increasingly individuated and heterogeneous […] Divergence implies that as children grow older, the discrepancies rather than the similarities in their use of language become more evident this is because those features of language that develop with age are precisely those that are most sensitive to social and cultural experiences, such as advanced vocabulary or low-frequency syntactic structures. As children grow, their sources of language input become increasingly varied. While young children experience with language is mainly spoken, schoolchildren and adolescents are also exposed to written input. Vocabulary becomes more specialized due to difference in schooling and the semantic specificity of the lexicon changes dramatically with age. Developing divergence involves two factors, one psychological and the other cultural. The psychological factor is possession of a 'theory of mind'. The cultural factor is literacy, in the sense of participating in the communicative activities of a literate community"

4. STUDY 3: CHILDREN VERSUS ADULTS' DEFINITIONAL ABILITIES.

4.1 Introduction

Our main purpose for this study is to examine the relevant differences between an early-and- constantly-evolving stage of definition by primary schoolers and an adult-like stable state of definition, in which developments are much more localized and changes, when produced, happen at a slow rate.

According to the results obtained in study 1, 7-year-old children's repertoire for defining concrete and abstract nouns, adjectives and verbs displays the whole range of possible syntactic realizations; moreover, results obtained for the semantic dimension indicate that 7-year-old Spanish children are in their way of mastering the different components of the semantic dimension (i.e. categorical term, specificity of the hyperonym, and semantic content). That includes producing more hyperonyms, more specific hyperonyms, and reaching a higher definitional power in their expression of the semantic content. Certainly, there are important individual differences concerning the complexity of the syntactic structure and the categorical term of the definiens. Study 1 shows that the characteristics of the students are more important than the characteristics of the words for the syntactic dimension and the categorical term of the definiens.

Regarding the syntactic structure of the definiens, primary schoolers define nouns, adjectives and verbs using pre-sentence structures, however, individual differences are found in the higher percentage of use of syntactic structures of a higher complexity level, namely complex sentences and relative clauses, that older children exhibit compared to the younger ones.

In terms of the categorical term of the definiens, results from study 1 showed that children include relational terms (i.e. terms semantically related to the definiendum

that due to their level of generality cannot be considered as hyperonyms), for example "*un asno*" 'an ass' for the definiendum *burro* 'donkey', and "*es un guerrero*" 'he is a warrior' for the definiendum *valiente* 'brave'. Nevertheless, individual differences are found in the percentage of use of hyperonyms, for every morphological category, by older children compared to the young ones. Moreover, these differences are more salient in the case of nouns, compared to adjectives or verbs.

Concerning the specificity of the hyperonym and the semantic content of the definiens, results from study 1 revealed that when 7-year-old children produce hyperonyms in their definiens, these are all-purpose terms like 'something', 'somebody', or 'a thing' and therefore, these terms are low in their level of specificity. Furthermore, primary schoolers express the semantic content of their definiens through a synonym, or they describe the external characteristics or a property of the definiendum (e.g., 'it has ears' for the definiendum *donkey*; 'it's white' for the definiendum *diamond*), or they provide the function fulfilled by the definiendum (e.g., 'to cut the food' for the definiendum *knife*). This is only the case for noun and adjective definiendums. In the case of verbs, children express the semantic content of their definiens through contextual characteristics (e.g., 'that, for example, you are sick, you go to school or to some activity and you give it (to somebody)' for the definiendum *contagious*).

As for adults, results from our second study showed that adult speakers use relative clauses to define concrete and abstract nouns and adjectives, while they use complex sentences to define concrete and abstract verbs.

Concerning the categorical term of the definiens, adults use hyperonyms with a high level of specificity to define nouns and verbs, and relational terms to define

adjectives; only when the level of abstraction of the definiendum is low, adjectives are also categorized with hyperonyms.

With regard to the semantic content of the definiens, adults express the semantic content of nouns, adjectives and verbs through definitional features when the level of abstraction of the definiendum is low. However, when the level of abstraction of the definiendum is high, adults express the semantic content of their definiens through a synonym, through external characteristics or a property of the definiendum, or by means of providing the function fulfilled by the definiendum.

In the light of the outcome of studies 1 and 2, these observed differences point at the need to draw a systematic comparison between children and adults' definitional abilities.

4.2 Objectives

The goal of the present study is to establish, in a systematic way, the significance of the observed differences in the definitional style of Spanish primary schoolers and adults in our sample and to determine whether and how these differences interact with age-group. Only by drawing a systematic comparison between the two age groups can we explain how the characteristics of the words to be defined, namely morphological category and level of abstraction of the definiendum, affect the syntactic and semantic dimensions of the definiens 7-year-old children and adults provide when asked to define a word.

To address this goal, we confront word definition performance of the participants of studies 1 and 2 to examine–the possible interactions between age and morphological category of the definiendum, and between age and level of abstraction of the definiendum. We expect to find significant differences in the syntactic and semantic dimensions of the *definiens* that children and adults produce as a function of age.

4.3 Method

4.3.1 Participants

The study embraces the participants in Study 1 and Study 2; thus, it includes a total number of 169 participants, 73 boys and 66 girls, with a mean age of 82.27 months (range 73-88 months, SD=3.4) and 15 men and 15 women (M=32 years, range 22-38).

4.4 Strategy of Analysis

To detect the sources of variance in word definition performance of both groups of age, we analysed word definitions in a multilevel model. In our multi-level model, we explained each student's word definition by the level-one distance from the mean and the level-two: students' age, community, morphological category and level of abstraction of the *definiendum*. Different analyses were used in our multi-level model:

(1) We used a binary model and performed a Multilevel Binary Logistic Regression analysis with a transformation of the syntactic complexity ordinal scale into a binary one to test preliminary hypothesis on the division between *don't know* and *know* answers. We tested the effect of the IVs *age* and *community*, at student level in level two, and the effect of the *morphological category* and the *level of abstraction of the definiendum* at the word level in level two, on the probability of the participants not providing a definiens, that is, answering *don't know* (see Table D.1 in Appendix D)

(2) We used a hierarchical linear model and performed a Multilevel Regression analysis to test the effect of the IVs *age* and *community*, at student level in level two, and the effect of the morphological category and the level of abstraction of the definiendum at the word level in level two, on the variance of the syntactic structures of nouns, adjectives and verbs definiens.

(3) We used a multilevel ordered logit model and performed a Multilevel Ordinal Logistic Regression analysis to estimate the effect of the IVs age and community, at student level in level two, and the effect of the morphological category and the level of abstraction of the definiendum at the word level in level two, on the level of syntactic complexity of the structure of the definition, and the semantic complexity of the categorical term, the specificity of the hyperonym, and the semantic content of the definiens. That the model is ordered means that the probability of being in a higher category is cumulative with respect to the probability of being in a lower category.

(4) Finally, we calculated the *cumulative probabilities* for the syntactic complexity ordinal scale and for each one of the semantic sub-dimensions to show how different characteristics of students and words represented different probabilities to be on a specific ordered category in the syntactic and semantic dimension ordinal scales, and how the cumulative probability varied across different students and words.

We ran a dummy dependent variable to distinguish between full answers and *don't know* answers, which account for around 40% of the cases (see Table D.1 in Appendix D). In the analyses for the syntactic dimension, we evaluate syntactic complexity of the students' definiens for each word, by level one distance from the mean (var) and level two observations: students (age and community) and words (morphological category and level of abstraction of the definiendum). The multilevel regression analyses of the syntactic dimension are followed by the analysis of the interactions between age and morphological category of the definiendum, and between age and level of abstraction of the definiendum, and by the predicted cumulative probabilities.

The second part of the analysis concerns the semantic dimension of word definition performance. Similarly, to the analysis performed for the first dimension, we evaluate each sub-dimension of the semantic dimension of the definiens (i.e. categorical term of the definiens, specificity of the hyperonym and semantic content of the definiens) to explore semantic complexity for each word by level one distance from the mean (*var*) and level two observations regarding students and words. The multilevel regression analysis of each of the semantic sub-dimensions is followed by the analysis of the interactions between age and morphological category of the definiendum, and between age and level of abstraction of the definiendum, and by the predicted cumulative probabilities.

4.5 Results

4.5.1 Analysis of the Variance for the Syntactic Dimension

We ran a Multilevel Regression Model to test the variance of the syntactic structures of noun, verb and adjective definitions in a hierarchical linear model. The dependent variable was the student's mean variance (*var*) taken as a continuous variable (the within mean of each student's word definition by morphological category). The independent variables were measured in two different levels inside level two: the age and the community, which varied by students; and the morphological category and the level of abstraction of the definiendum, which varied by words. We also tested the possible effect of interactions of the variables: age and morphological category; level of abstraction and morphological category; and level of abstraction and age. Table 27 presents the estimates for the different models and the components of the explained variance between the levels.

Table 27

Multilevel Regression. Testing Students' Mean Variance on the Syntactic Dimension

		Model 1	Model 2	Model 3	Model 4
Fixed effects	Intercept	1.79*** (0.08)	1.91*** (0.08)	2.01*** (0.14)	2.00*** (0.13)
L2: Student level	Age			−0.50*** (0.10)	−0.43*** (0.11)
	Community			0.06 (0.12)	0.06 (0.12)
L2: Word level	Adjectives vs. Nouns		0.08 (0.16)	−0.13 (0.17)	0.01 (0.68)
	Verbs vs. Nouns		−0.58*** (0.14)	−0.71*** (0.14)	−0.38 (0.21)
	Abstract			0.12* (0.05)	0.17** (0.05)
Students by Word Interaction	Age X Adj vs. N				−0.17 (0.12)
	Age X Verbs vs. N				−0.18 (0.10)
	Abstract X Adj vs. N				−0.12 (0.57)
	Abstract X Verbs vs. N				−0.55 (0.29)
	Abstract X Age				−0.16*** (0.04)
Variance components					
Level 1		1.10 (1.05)	1.10 (1.05)	1.10 (1.05)	1.09 (1.04)
Level 2 - students	Student intercept $\sigma_{student}^2$	0.21*** (0.46)	0.21*** (0.46)	0.17*** (0.42)	0.17*** (0.42)
Level 2 - words	Word intercept σ_{word}^2	0.15*** (0.39)	0.09*** (0.30)	0.08*** (0.27)	0.07*** (0.26)
ICC students		.14	.15	.13	.13
ICC words		.10	.06	.06	.05
Pseudo R^2			.04	.08	.08

Note. Values enclosed in parentheses represent standard errors (for fixed effects) and standard deviation (for random parameters).
*p<.05 **p<.01 ***p<.001.

The unconditional model (model 1) provided the percentage of variance explained by the crossed level-two effects –students and words–, regardless of any potential explanatory variable. Table 27 showed that the intra-class correlation (ICC) which measures the sources of variation at the higher level variables (level-two variables) was 14% for the student level and 10% for the word level. These percentages of explained variance are fairly significant and lent support to the premise of within-words and within-students effect. That is, being a child or an adult (age) is more important than the morphological category and the level of abstraction of the word to be defined in order to explain variance in word definitions of primary schoolers and adults. The percentages of variance explained decreased for the student level and for the word level (15% and 13% for the student level; and 6% and 6% for the word level), however they are still considered meaningful.

Model 3 measured the effect of all the independent variables. At the student level, results showed that the older the age of the students, the lower the average value for this variance ($b=-0.50$, $p<.001$), which means that the variance was lower for adults compared to children. This may be due to a higher percentage of adults' answers exhibited in the highest categories of response of the different scales for both syntactic and semantic dimensions.

The fourth model, showed a similar distribution (compared to model 3) across the different categories, and a significant interaction between age and level of abstraction of the definiendum ($b=-0.16$, $p<.001$). As a result of this interaction we present in table 27.1 the detail of the results.

Table 27.1 illustrates the interaction between the age and the level of abstraction of the definiendum found in table 27. In order to simplify the interaction analysis, we divided it into two model runs for children and adults separately. Given that sources of

interaction in our cross classification model were derived from word effect and student effect, a standard interaction analysis could not be done. However, by dividing the model into two runs we were able to compare the effects of the independent variables on the variance of the syntactic structures.

Table 27.1

Interactions for the Mean Variance on the Syntactic Dimension

		Children	Adults
Fixed effects	Intercept	1.99***	1.58***
		(0.19)	(0.12)
L2: Student level	Age	0.02	
		(0.01)	
	Community	0.07	0.01
		(0.17)	(0.12)
L2: Word level	Adjectives vs. Nouns	−0.10	−1.06
		(0.19)	(0.80)
	Verbs vs. Nouns	−0.68***	−1.11***
		(0.15)	(0.24)
	Abstract	0.15*	−0.02
		(0.06)	(0.06)

Note. Values enclosed in parentheses represent standard errors (for fixed effects) and standard deviation (for random parameters)
*p<.05 **p<.01 ***p<.001

Results for the two different models on Table 27.1 showed that adults present less variation than children when the level of abstraction of the definiendum increases. This means that an increase in the level of abstraction of the definiendum entails an increase in the variance of the syntactic structures of the definiens for children, but not for adults. Overall, these results made the case for further probability analysis that will be shown in the next sections.

4.5.2 Syntactic Dimension

4.5.2.1 Syntactic Complexity Ordinal Scale

We ran an Ordered Logit Model to evaluate the performance of the participants on the syntactic complexity of the *definiens'* structure. This analysis allowed us to estimate the probability of the definiens to be realized by means of a pre-sentence structure, a simple sentence, a complex sentence, or a relative clause. The dependent variable was the complexity of the syntactic structure of the definiens. The independent variables were measured in two levels: the variance (*var*) at level 1, which varied at the individual level (Student x Word); and at level two: age and community, which varied by student; and the morphological category and the level of abstraction of the definiendum, which varied by word. We also tested the possible effect of interactions of the variables age and morphological category; level of abstraction and morphological category; and age and level of abstraction. The methodology for this analysis required the same procedure followed in the *variance* analysis.

Table 28 shows regression estimates for all cases of the syntactic complexity scale excluding the *don't know* cases. We also performed multilevel ordinal logistic regression analyses for the syntactic and semantic dimensions including the *no answer* in the respective scales. However, given the number of cases of *don't know* answers in children, we decided to perform the multilevel regression analyses excluding the *don't know* cases in order to avoid the chance that a dominant category of *don't know* (29%) could bias the estimation. These analyses, excluding the *don't know* cases, would be the ones presented in this section of the syntactic dimension and in the subsequent sections regarding sub-dimensions of the semantic dimension of the definition. See table D.2 in Appendix D for the full array of responses, including the *no answer*, across the four different models.

Table 28

Multilevel Ordinal Logistic Regression. Four Stage Analysis with Fixed and Random Effects Predicting the Probability of the Complexity of the Syntactic Structure of the Definiens

		Model 1	Model 2	Model 3	Model 4
Fixed effects	Intercept	−0.59***	−0.46**	−0.10	−0.21
		(0.14)	(0.15)	(0.33)	(0.33)
	Thold 2	0.51***	0.51***	0.70***	0.71***
		(0.03)	(0.03)	(0.04)	(0.04)
	Thold 3	1.48***	1.49***	2.10***	2.14***
		(0.04)	(0.04)	(0.06)	(0.06)
L1: Student *word	Student mean variance			−1.31***	−1.38***
				(0.04)	(0.04)
L2: Student level	Age			−2.61***	−2.26***
				(0.27)	(0.28)
	Community			−0.19	−0.21
				(0.32)	(0.32)
L2: Word level	Adjectives vs. Nouns		−0.80**	−0.60*	−0.31
			(0.26)	(0.28)	(1.01)
	Verbs vs. Nouns		−0.05	0.07	0.84*
			(0.23)	(0.23)	(0.33)
	Abstract			−0.10	−0.09
				(0.08)	(0.08)
Students by Word Interaction	Age X Adj vs. N				−1.59***
					(0.31)
	Age X Verbs vs. N				−1.19***
					(0.24)
	Abstract X Adj vs. N				0.22
					(0.84)
	Abstract X Verbs vs. N				−0.37
					(0.46)
	Abstract X Age				−0.11
					(0.08)
Variance components					
Level 2 - students	Student intercept $\sigma_{student}^2$	1.40***	1.40***	1.26***	1.27***
		(1.18)	(1.18)	(1.12)	(1.12)
Level 2 - words	Word intercept σ_{word}^2	0.29***	0.22***	0.17***	0.12***
		(0.54)	(0.47)	(0.41)	(0.34)
ICC students		.28	.29	.27	.27
ICC words		.06	.04	.04	.03
Pseudo R^2			.01	.05	.06

Note. Values enclosed in parentheses represent standard errors (for fixed effects) and standard deviation (for random parameters).
*p<.05 **p<.01 ***p<.001.

Table 28 showed that regardless of any potential explanatory variable the student level (ICC students) explained 28% of the variance while the word level (ICC words) explained 6% of the variance. At the student level, results showed that the older the age of the students the higher the probability to be in a higher ordered category ($b=-2.61$, $p<.001$), in other words, adults had a higher probability to use more complex syntactic structures in their definiens compared to children. The syntactic structures adults used in their definiens are placed in higher ordered categories of the syntactic complexity scale (i.e. complex sentence and relative clause). Coming from a monolingual or a bilingual community did not make a difference in the complexity of the syntactic structure of participants' definiens.

The percentage of variance explained in the model that tests the effect of all the independent variables (model 3) showed that the percentage of variance explained by the subject level was higher in comparison with the percentage of variance explained by the words level (27% and 4% for subjects and words, respectively). Again, this result means that being a child or an adult is the most important characteristic in order to explain the syntactic complexity of the structures of the definiens.

Model 4 showed a similar distribution across the different categories, and a significant interaction between age and morphological category of the definiendum ($b=-1.59$ $p<.001$; $b=-1.19$ $p<.001$, for adjectives and verbs, respectively). As a result of this interaction we present in table 28.1 the detail of the results.

Table 28.1 illustrates the interaction between age and morphological category of the definiendum observed in table 28. In order to simplify the interaction analysis, we divided it into two model runs for children and adults separately. Given that sources of interaction in our cross classification model were derived from word effect and student effect, a standard interaction analysis could not be done. However, by dividing the model into two runs we were able to compare the effects of independent variables in the syntactic complexity of the definiens' structure.

Table 28.1

Interactions for the Probability of the Complexity of the Syntactic Structure of the Definiens

		Children	Adults
Fixed effects	Intercept	−0.33 (0.61)	−4.71*** (0.36)
	Thold 2	0.99*** (0.06)	2.66*** (0.20)
	Thold 3	2.98*** (0.11)	3.45*** (0.21)
L1: Student *word	Student mean variance	−2.33*** (0.07)	0.86*** (0.07)
L2: Student level	Age	−0.07 (0.04)	
	Community	−0.63 (0.61)	0.38 (0.22)
L2: Word level	Adjectives vs. Nouns	0.35 (0.37)	−0.74 (0.58)
	Verbs vs. Nouns	1.08** (0.31)	1.17* (0.48)
	Abstract	−0.14 (0.11)	0.02 (0.17)

Note. Values enclosed in parentheses represent standard errors (for fixed effects) and standard deviation (for random parameters)
*p<.05 **p<.01 ***p<.001

Results for the two different models on Table 28.1 showed that the effect of the morphological category was higher on adults compared to children. Therefore, when the morphological category of the definiendum changed from noun to verb, the word became more difficult to define for adults than for children.

Although we received a significative interaction effect between age and morphological category for adjectives vs. nouns, the simple slope per each group was not significant. That is, even though there are differences between the complexity of the syntactic structure of the definiens between children and adults, this difference did not reach a significant effect.

4.5.2.1.1 Cumulative Probabilities for the Syntactic Complexity Ordinal Scale

To complete the analysis of the syntactic complexity of the structure of the definiens, we calculated the cumulative probability of the students' definiens being in a certain category level of the syntactic complexity ordinal scale, without taking into account the *no answer*. These probabilities were calculated for different students, characterized by deviation from the mean, to show how different characteristics of students and words represented different probabilities of the students' *definiens* to be on a specific category in the syntactic complexity ordinal scale, and how the cumulative probability varied across different students and words. The probabilities for the *mean* are shown in the first column (noun) of table 29. Given that all continuous variables were centred around the mean, the probability for an average student was related to nouns (zero for adjectives and zero for verbs). The constant shift in these probabilities reflected the effect of the morphological category of the definiendum. The age effect was illustrated by the younger and older ages (one standard deviation below and above the *zero-mean*, respectively), and the effect of the level of abstraction was illustrated by the low level and the high level of abstraction of the definiendum (one standard deviation below and above the *zero-mean*, respectively).

Table 29 presents these cumulative probabilities for the different morphological categories, the age of the students, and the level of abstraction of the definiendum. This table (and the rest of the cumulative probabilities tables in this study) express cumulative probabilities and, as such, the percentages for each one of the levels of the syntactic complexity scale accumulate from one category to the next reaching the 100% at the highest level of the scale. However, in order to simplify the reading of these tables, we present the real mean percentages for each one of the levels of the syntactic complexity scale instead of presenting the cumulative percentage. We followed this

same criterion in the presentation of the cumulative probability tables for the analysis of the semantic dimension of the definition.

Table 29

Predicted Cumulative Probabilities for the Ordered Categories of the Syntactic Complexity of the Definiens

		Morphological Category			Age		Abstraction	
MC	Scale Levels	Nouns	Adj	Verbs	Children	Adults	Low	High
Noun	Pre-sentence	48	33	49	48	6	50	45
	Simple Sentence	16	17	17	16	6	17	17
	Complex Sentence	24	30	23	24	23	22	25
	Relative Clause	12	20	11	12	65	11	13
Adj	Pre-sentence				33	4	36	31
	Simple Sentence				17	3	17	16
	Complex Sentence				30	16	29	31
	Relative Clause				20	77	18	22
Verb	Pre-sentence				49	7	52	47
	Simple Sentence				17	6	17	17
	Complex Sentence				23	24	21	24
	Relative Clause				11	63	10	12

Note. The values represent mean percentages for each level of the ordinal scale

Results from table 29 showed that the cumulative probability for children to produce a noun, adjective or verb definiens of a lower syntactic complexity was higher than for adults. That is, adults' definitions were syntactically more complex than children's definitions. The higher percentages for adults were found in the highest category of the syntactic complexity ordinal scale, relative clause (65%, 77%, and 63%, for nouns, adjectives and verbs, respectively); while children concentrate the higher percentages of answers in the lower level of the syntactic complexity scale, presentence structures (48%, 33%, and 49%, for nouns, adjectives, and verbs, respectively). Now, the cumulative probabilities for the ordered categories of the syntactic complexity of the definiens presented in study 2 for adults, showed that the highest category of the syntactic complexity for verbs was a complex sentence. This difference between the cumulative probabilities of study 2 and the results of the syntactic complexity for verbs showed in Table 29 is due to statistical reasons, and the result is mediated by the results of children. Meaning that including the whole sample of students for this analysis caused this little variation in the results, without invalidating the results obtained for the cumulative probabilities of study 2.

These trends provided support to the results presented in table 28, which showed main effects of age and morphological category of the definiendum in the syntactic complexity of the definiens.

4.5.3 Semantic Dimension

4.5.3.1 Categorical Term of the Definiens

We ran an Ordered Logit Model to evaluate the performance of the participants on the production of a categorical term in the *definiens*. This analysis allowed us to estimate the probability of the definiens to be in one of the following categories of the categorical term ordinal scale: absence of categorical term, relational term, and hyperonym. The dependent variable was the categorical term the students used in their definitions, measured with the ordinal scale presented above. The independent variables were measured in two levels: variance at level 1, which varied at the individual level; and at level 2 age and community, which varied by students; and morphological category and level of abstraction of the definiendum, which varied by word. We also tested the possible effect of interactions of the variables age and morphological category; level of abstraction and morphological category; and level of abstraction and age. The methodology followed for this analysis –and for the rest of the analyses in the semantic dimension– was the same one followed for the previous analyses of the *variance* and the syntactic complexity of the definiens. Note that this analysis excludes the *don't know* cases. For the full array of responses, including the *no answer*, across the four different models, see table D.3 in Appendix D. Table 30 shows regression estimates for all cases of the categorical term of the definiens' scale across the four different models.

Table 30

Multilevel Ordinal Logistic Regression. Four Stage Analysis with Fixed and Random Effects Predicting the Probability of the Categorical Term of the Definiens

		Model 1	Model 2	Model 3	Model 4
Fixed effects	Intercept	0.07	−0.48	−0.70*	−0.91**
		(0.25)	(0.26)	(0.35)	(0.34)
	Thold 2	1.14***	1.15***	1.83***	1.83***
		(0.04)	(0.04)	(0.07)	(0.07)
L1: Student *word	Student mean variance			−3.56***	−3.57***
				(0.12)	(0.12)
L2: Student level	Age			−3.35***	−3.03***
				(0.25)	(0.27)
	Community			1.38	1.39
				(0.30)	(0.29)
L2: Word level	Adjectives vs. Nouns		1.42**	−0.03	0.96
			(0.52)	(0.45)	(1.75)
	Verbs vs. Nouns		1.51**	0.95*	1.51*
			(0.46)	(0.38)	(0.58)
	Abstract			0.68***	0.51***
				(0.14)	(0.13)
Students by Word Interaction	Age X Adj vs. N				−0.51
					(0.33)
	Age X Verbs vs. N				−1.12***
					(0.32)
	Abstract X Adj vs. N				−0.63
					(1.47)
	Abstract X Verbs vs. N				0.15
					(0.81)
	Abstract X Age				0.39***
					(0.10)
Variance components					
Level 2 - students	Student intercept $\sigma_{student}^2$	2.27***	2.27***	1.00***	1.00***
		(1.51)	(1.51)	(1.00)	(0.99)
Level 2 - words	Word intercept σ_{word}^2	1.52***	1.01***	0.52***	0.43***
		(1.23)	(1.00)	(0.72)	(0.66)
ICC students		.32	.35	.21	.21
ICC words		.21	.15	.11	.09
Pseudo R^2			.07	.32	.33

Note. Values enclosed in parentheses represent standard errors (for fixed effects) and standard deviation (for random parameters).
*p<.05 **p<.01 ***p<.001.

Results for Table 30 showed that the older the age of the students the higher the probability to be in a higher ordered category (b=−3.35, p<.001), that is, adults had a higher probability to include in their definiens a categorical term placed in higher levels of the scale compared to children, therefore, adults present higher probabilities to categorize the definiendum with an hyperonym than children. Coming from a monolingual or a bilingual community did not make a difference in the student's including a categorical term in their definiens.

The percentage of variance explained in the model testing the effect of all the independent variables showed that the percentage of variance explained by the subject level was higher in comparison with the percentage of variance explained by the words level (21% and 11% for subjects and words, respectively). As observed in the percentage of variance explained for students and words in the analysis of the syntactic complexity of the definiens, being a child or an adult is more important than having to define a concrete or abstract noun, adjective or verb in order to explain the differences in the inclusion of a categorical term in the participants' definiens.

Model 4 showed a similar distribution across the different categories. This model showed significant interactions between age and morphological category of the definiendum (b=−1.12 p<.001, verbs versus nouns), and between age and level of abstraction of the definiendum (b=0.39 p<.001). As a result of this interaction we present in table 30.1 the detail of the results. Table 30.1 below illustrates the interaction between age and the complexity of the word (morphological category and level of abstraction of the definiendum).

Table 30.1

Interactions for the Probability of the Categorical Term of the Definiens

		Children	Adults
Fixed effects	Intercept	−1.36** (0.43)	−7.82*** (0.56)
	Thold 2	2.73*** (0.14)	3.51*** (0.26)
L1: Student *word	Student mean variance	−6.39*** (0.22)	3.24*** (0.22)
L2: Student level	Age	−0.10*** (0.03)	
	Community	1.32 (0.40)	1.08 (0.41)
L2: Word level	Adjectives vs. Nouns	0.56 (0.53)	2.77*** (0.79)
	Verbs vs. Nouns	2.23*** (0.48)	2.12** (0.65)
	Abstract	0.54*** (0.15)	0.76** (0.24)

Note. Values enclosed in parentheses represent standard errors (for fixed effects) and standard deviation (for random parameters)

*p<.05 **p<.01 ***p<.001

Results for the two different models on Table 30.1 showed that the effect of the morphological category of the definiendum *verb* compared to *noun* affected both children and adults, but the effect was higher on children compared to adults. Therefore, when the morphological category of the definiendum changed from noun to verb, the word became more difficult to define, in terms of the production of a categorical term in the definiens, for children than for adults. In other words, it was more difficult for children to provide a categorical term for verbs compared to nouns than for adults.

In addition, Table 30.1 showed that the level of abstraction of the definiendum affected both groups of age, but the effect was higher on adults compared to children. Therefore, a change in the level of abstraction of the definiendum made more difficult for adults, compared to children, to include in their definiens a categorical term placed in higher levels of the scale.

4.5.3.1.1 Cumulative Probabilities for the Categorical Term of the Definiens

To complete the analysis of the categorical term of the definiens, we calculated the cumulative probability of students' definiens being in a certain category of the categorical term ordinal scale without taking into account the *no answer*. These probabilities were calculated for different students, characterized by deviation from the mean, to show how different characteristics of students and words represented different probabilities to be on a specific category level in the ordinal scale for the categorical term of the definiens, and how the cumulative probability varied across different students and words. The probabilities for the mean are shown in the first column (noun) of table 31. Because all continuous variables were centred around the mean, the probability for an average student was related to nouns. The constant shift in these probabilities reflected the effect of the morphological category of the definiendum. The

age effect was illustrated by the younger and older ages, and the effect of the level of abstraction was illustrated by the low level and the high level of abstraction of the definiendum. Table 31 presents these cumulative probabilities for the different morphological categories, the age of the students, and the level of abstraction of the definiendum.

Table 31

Predicted Cumulative Probabilities for the Ordered Categories of the Categorical Term of the Definiens

		Morphological Category			Age		Abstraction	
MC	Scale Levels	Nouns	Adj	Verbs	Children	Adults	Low	High
Noun	Absence of CT	33	33	56	33	2	18	53
	Relational Term	43	42	33	43	8	40	35
	Hyperonym	24	25	11	24	90	42	12
Adj	Absence of CT				32	2	18	52
	Relational Term				43	8	39	35
	Hyperonym				25	90	43	13
Verb	Absence of CT				56	4	36	75
	Relational Term				33	18	42	20
	Hyperonym				11	78	22	5

Note. The values represent mean percentages for each level of the ordinal scale

Results from table 31 showed that the cumulative probability for children to categorize nouns, adjectives and verbs with an hyperonym was lower than for adults. That is, adults definitions were better categorized than children's definitions. The higher percentages for children were found in the inclusion of a relational term in their nouns and adjectives' definiens (42%, and 42%, for nouns and adjectives, respectively). In the case of verbs, children did not provide a categorical term (56%). For adults, on the other hand, the probability of including a hyperonym in their definiens increased dramatically (90%, 90%, and 78%, for nouns, adjectives and verbs, respectively) compared to children's use of hyperonyms in their definiens (24%, 25%, and 11%, for nouns, adjectives and verbs, respectively).

The cumulative probabilities for the ordered categories of the categorical term of the definiens presented in study 2 for adults, showed that the highest category of the categorical term for adjectives was a relational term. This difference between the cumulative probabilities of study 2 and the results of the categorical term for adjectives showed in Table 31 is due to statistical reasons, and the result is mediated by the results of children. Meaning that including the whole sample of students for this analysis caused this little variation in the results, without invalidating the results obtained for the cumulative probabilities of study 2.

These trends provided support to the results presented in Table 30, which showed main effects of age, morphological category and level of abstraction of the definiendum in the categorical term of the definiens.

4.5.3.2 *Specificity of the Hyperonym*

We ran an Ordered Logit Model to evaluate the performance of the participants on the specificity of the hyperonym the students produced in their definiens. This analysis allowed us to estimate the probability of the definiens to be in one of the following categories of the level of specificity of the hyperonym ordinal scale: low specificity, middle specificity and high specificity. The dependent variable was the level of specificity of the hyperonym the students used in their definiens, measured with the ordinal scale presented above. The independent variables were measured in two levels: the variance at level 1, which varied at the individual level; and at level 2, the age and the community, which varied by students; and the morphological category and the level of abstraction of the definiendum, which varied by word. We also tested the possible effect of interactions of the variables age and morphological category; level of abstraction and morphological category; and age and level of abstraction of the definiendum. Note that this analysis excludes the *don't know* cases. For the full array of responses, including the *no answer*, across the four different models see table D.4 in Appendix D. Table 32 shows regression estimates for all cases of the level of specificity of the hyperonym scale across the four different models.

Table 32

Multilevel Ordinal Logistic Regression. Four Stage Analysis with Fixed and Random Effects Predicting the Probability of the Level of Specificity of the Hyperonym

		Model 1	Model 2	Model 3	Model 4
Fixed effects	Intercept	1.72***	0.50	0.67	0.21
		(0.42)	(0.34)	(0.42)	(0.42)
	Thold 2	1.38***	1.38***	1.88***	1.92***
		(0.05)	(0.05)	(0.08)	(0.08)
	Thold 3	1.83***	1.83***	2.62***	2.70***
		(0.06)	(0.06)	(0.09)	(0.09)
L1: Student *word	Student mean variance			−2.25***	−2.31***
				(0.08)	(0.08)
L2: Student level	Age			−2.75***	−2.14***
				(0.27)	(0.28)
	Community			1.01	1.01
				(0.31)	(0.32)
L2: Word level	Adjectives vs. Nouns		4.75***	3.20***	4.85
			(0.76)	(0.77)	(3.30)
	Verbs vs. Nouns		2.31***	2.03**	2.62**
			(0.63)	(0.59)	(0.96)
	Abstract			0.96***	0.59**
				(0.21)	(0.21)
Students by Word Interaction	Age X Adj vs. N				−0.17
					(0.75)
	Age X Verbs vs. N				−1.42**
					(0.48)
	Abstract X Adj vs. N				−1.56
					(2.69)
	Abstract X Verbs vs. N				0.62
					(1.27)
	Abstract X Age				0.79***
					(0.11)
Variance components					
Level 2 - students	Student intercept $\sigma_{student}^2$	3.10***	3.08***	1.13***	1.15***
		(1.76)	(1.76)	(1.06)	(1.07)
Level 2 - words	Word intercept σ_{word}^2	4.79***	1.89***	1.37***	1.18***
		(2.19)	(1.37)	(1.17)	(1.09)
ICC students		.28	.37	.20	.20
ICC words		.43	.23	.24	.21
Pseudo R^2			.26	.48	.50

Note. Values enclosed in parentheses represent standard errors (for fixed effects) and standard deviation (for random parameters).
*p<.05 **p<.01 ***p<.001.

Results from Table 32 revealed that the older the age of the students, the higher the probability to be in a higher ordered category (b=−2.75, p<.001). In other words, adults had a higher probability to use a hyperonym with a high level of specificity than children. Coming from a monolingual or a bilingual community did not make a difference in the level of specificity of the hyperonym of participants' definiens.

The percentage of variance explained in the model that tests the effect of all the independent variables (model 3) showed that the percentage of variance explained by the word level was higher in comparison with the percentage of variance explained by the students' level (24% and 20% for words and students, respectively). This result means that the morphological category and the level of abstraction of the definiendum are more important than the age of the participants in order to include a hyperonym with a high level of specifity in their definiens.

Model 4 showed a similar distribution across the different categories and a significant interaction between age and morphological category of the definiendum (b=−1.42, p<.01, verbs vs. nouns), and between age and level of abstraction of the definiendum (b=0.79 p<.001). As a result of this interaction, we present in table 32.1 the detail of the results.

Table 32.1 illustrates the interaction between age and the complexity of the word. In order to simplify the interaction analysis, we divided it into two model runs for children and adults separately. Given that sources of interaction in our cross classification model were derived from word effect and student effect, a standard interaction analysis could not be done. However, by dividing the model into two runs, we were able to compare the effects of independent variables in the level of specificity of the hyperonym.

Table 32.1

Interactions for the Probability of the Level of Specificity of the Hyperonym

		Children	Adults
Fixed effects	Intercept	0.75 (0.56)	−6.43*** (0.50)
	Thold 2	4.41*** (0.21)	4.91*** (0.27)
	Thold 3	6.89*** (0.33)	5.50*** (0.28)
L1: Student *word	Student mean variance	−5.34*** (0.20)	0.23 (0.12)
L2: Student level	Age	−0.10** (0.03)	
	Community	0.41 (0.49)	0.93 (0.40)
L2: Word level	Adjectives vs. Nouns	2.58* (1.05)	2.45*** (0.70)
	Verbs vs. Nouns	3.71*** (0.92)	0.93 (0.56)
	Abstract	0.84*** (0.22)	0.88*** (0.21)

Note. Values enclosed in parentheses represent standard errors (for fixed effects) and standard deviation (for random parameters)
*p<.05 **p<.01 ***p<.001

Results for the two different models on Table 32.1 showed that the morphological category of the definiendum affected the level of specificity of children's hyperonyms. Conversely, the level of specificity of adults' hyperonyms did not change as a function of the morphological category of the definiendum. Therefore, when the morphological category of the definiendum changed from noun to verb, the word became more difficult to categorize with a hyperonym of a high specificity level for children than for adults. In other words, it was more difficult for children to provide a hyperonym with a high level of specificity for verbs, compared to nouns, than for adults.

In addition, Table 32.1 showed that the level of abstraction of the definiendum affected both groups of age, but the effect was higher on adults compared to children. Therefore, a change in the level of abstraction of the definiendum made more difficult for adults, compared to children, to include in their definiens a hyperonym placed in higher levels of specificity of the scale.

4.5.3.2.1 Cumulative Probabilities for the Specificity of the Hyperonym

To complete the analysis of the level of specificity of the hyperonym in the participants' definiens, we calculated the cumulative probability for the three different levels of specificity of the hyperonym ordinal scale. These probabilities were calculated for different representing students, characterized by deviation from the mean, to show how different characteristics of students and words represent different probabilities to be on a specific category in the scale for the level of specificity of the hyperonym, and how the cumulative probability varies across different students and words. The probabilities for the mean are shown in the first column (noun). Given that all continuous variables are centred around the mean, the probability for an average student is related to nouns (zero for adjectives and zero for verbs). The constant shift in these probabilities reflects the

effect of the morphological category of the words. The age effect is illustrated by the younger and older ages (one standard deviation below and above the zero-mean, respectively), and the effect of the level of abstraction of the word is illustrated by the low and high level of abstraction (one standard deviation below and above the zero-mean, respectively). Table 33 presents these cumulative probabilities for the different morphological categories, the age of the students, and the level of abstraction of the definiendum.

Table 33

Predicted Cumulative Probabilities for the Ordered Categories of the Level of Specificity of the Hyperonym

		Morphological Category			Age		Abstraction	
MC	Scale Levels	Nouns	Adj	Verbs	Children	Adults	Low	High
Noun	Low specificity	67	78	96	67	—	45	84
	Middle specificity	29	19	4	29	4	45	15
	High specificity	4	3	—	4	96	10	1
Adj	Low specificity				78	1	59	90
	Middle specificity				20	7	35	9
	High specificity				2	92	6	1
Verb	Low specificity				96	5	91	98
	Middle specificity				4	31	8	2
	High specificity				—	64	1	—

Note. The values represent mean percentages for each level of the ordinal scale.

Dashes indicate lack of answers for that level of the ordinal scale.

Results from table 33 showed that the cumulative probability for children to produce a hyperonym with a high level of specificity was lower than for adults. In other words, adults provided hyperonyms with a higher level of specificity than those provided by children. When children included a hyperonym in their definiens, there was a high probability of being one with a low level of specificity (67%, 78%, and 96%, for nouns, adjectives and verbs, respectively). On the other hand, whenever adults provided a hyperonym, there was a high probability of being one placed at the highest level of specificity in the scale (95%, 92%, and 64%, for nouns, adjectives and verbs, respectively).

The cumulative probabilities for the ordered categories of the level of specificity of the hyperonym presented in study 2 for adults, showed that adjectives were categorized whith a relational term, and therefore, the category with the higher percentage for adjectives was the absence of a hyperonym. This difference between the cumulative probabilities of study 2 and the results of the level of specificity of the hyperonym for adjectives showed in Table 33 is due to statistical reasons, and the result is mediated by the results of children. Meaning that including the whole sample of students for this analysis caused this little variation in the results, without invalidating the results obtained for the cumulative probabilities of study 2.

These trends provided support to the results presented in Table 32, which showed main effects of age, morphological category and level of abstraction of the definiendum on the level of specificity of the hyperonym in the definiens.

4.5.3.3 Semantic Content of the Definiens

We ran an Ordered Logit Model to evaluate the performance of the participants on the definitional power of the semantic content of the definiens. This analysis allowed us to estimate the probability of the participants' definiens to be in one of the following categories of the scale for the semantic content: deixis and tautology, contextual, sindef (synonym, descriptive and functional), and definitional features. The dependent variable was the definitional power of the semantic content the students produced in their definiens, measured with the ordinal scale presented above. The independent variables were measured in two levels: variance at level 1, which varied at the individual level; and, at level 2, age and community, which varied by students; and morphological category and level of abstraction of the definiendum, which varied by word. We also tested the possible effect of interactions of the variables age and morphological category; level of abstraction and morphological category; and age and level of abstraction of the definiendum. Note that this analysis excludes the *don't know* cases. For the full array of responses, including the *no answer*, across the four different models see table D.5 in Appendix D. Table 34 shows regression estimates for all cases of the semantic content of the definiens' scale across the four different models.

Table 34

Multilevel Ordinal Logistic Regression. Four Stage Analysis with Fixed and Random Effects Predicting the Probability of the Semantic Content of the Definiens

		Model 1	Model 2	Model 3	Model 4
Fixed effects	Intercept	−2.10***	−2.53***	−2.45***	−2.51***
		(0.31)	(0.36)	(0.38)	(0.39)
	Thold 2	0.77***	0.77***	0.82***	0.86***
		(0.04)	(0.04)	(0.05)	(0.05)
	Thold 3	1.93***	1.94***	2.13***	2.23***
		(0.06)	(0.06)	(0.07)	(0.07)
	Thold 4	4.88***	4.88***	5.36***	5.50***
		(0.09)	(0.09)	(0.10)	(0.11)
L1: Student *word	Student mean variance			−0.73***	−0.71***
				(0.04)	(0.04)
L2: Student level	Age			−2.75***	−2.54***
				(0.22)	(0.23)
	Community			0.75	0.75
				(0.25)	(0.26)
L2: Word level	Adjectives vs. Nouns		0.67	−0.71	2.85
			(0.78)	(0.70)	(2.99)
	Verbs vs. Nouns		1.49*	0.49	0.91
			(0.69)	(0.58)	(0.91)
	Abstract			0.84***	1.00***
				(0.21)	(0.21)
Students by Word Interaction	Age X Adj vs. N				0.42
					(0.28)
	Age X Verbs vs. N				−1.73***
					(0.24)
	Abstract X Adj vs. N				−3.25
					(2.52)
	Abstract X Verbs vs. N				0.54
					(1.30)
	Abstract X Age				−0.45***
					(0.08)
Variance components					
Level 2 - students	Student intercept $\sigma_{student}^2$	1.18***	1.18***	0.75***	0.79***
		(1.08)	(1.08)	(0.87)	(0.89)
Level 2 - words	Word intercept σ_{word}^2	2.75***	2.38***	1.39***	1.38***
		(1.66)	(1.54)	(1.18)	(1.17)
ICC students		.16	.17	.14	.14
ICC words		.38	.35	.26	.25
Pseudo R^2			.05	.25	.24

Note. Values enclosed in parentheses represent standard errors (for fixed effects) and standard deviation (for random parameters).
*p<.05 **p<.01 ***p<.001.

Results of Table 34 showed that the older the age of the students the higher the probability to be in a higher ordered category of definitional power in the semantic content of the definiens (b=−2.75, p<.001). That is, adults had a higher probability to use semantic content of a higher definitional power in their definiens than children. Coming from a monolingual or a bilingual community did not make a difference in the definitional power of the semantic content of participants' definiens.

The percentage of variance explained in the model that tests the effect of all the independent variables (model 3) showed that the percentage of variance explained by the word level was higher in comparison with the percentage of variance explained by the students' level (26% and 14% for words and students, respectively). This result, like the one obtained for the level of specificity of the hyperonym, means that the morphological category and the level of abstraction of the definiendum are more important than the age of the participants in order to express the semantic content of their definiens with a higher definitional power.

Model 4 showed a similar distribution across the different categories and a significant interaction between age and morphological category of the definiendum (b=−1.73 p<.001, verbs vs. nouns) and between age and level of abstraction of the definiendum (b=−0.45 p<.001). As a result of this interaction, we present in Table 34.1 the detail of the results. Table 34.1 illustrates the interaction between age and the complexity of the word. In order to simplify the interaction analysis, we divided it into two model runs for children and adults separately. Given that sources of interaction in our cross classification model were derived from word effect and student effect, a standard interaction analysis could not be done. However, by dividing the model into two runs we were able to compare the effects of independent variables in the definitional power of the semantic content of the participants' definiens.

Table 34.1

Interactions for the Probability of the Semantic Content of the Definiens

		Children	Adults
Fixed effects	Intercept	−2.66*** (0.50)	−5.71*** (0.51)
	Thold 2	1.08*** (0.06)	1.90*** (0.20)
	Thold 3	2.58*** (0.09)	2.28*** (0.21)
	Thold 4	6.52*** (0.15)	3.81*** (0.23)
L1: Student *word	Student mean variance	−1.12*** (0.05)	0.64*** (0.06)
L2: Student level	Age	−0.10*** (0.02)	
	Community	0.35 (0.32)	1.05 (0.44)
L2: Word level	Adjectives vs. Nouns	−0.52 (0.94)	−0.16 (0.74)
	Verbs vs. Nouns	0.90 (0.78)	−0.09 (0.62)
	Abstract	1.10*** (0.28)	0.56* (0.23)

Note. Values enclosed in parentheses represent standard errors (for fixed effects) and standard deviation (for random parameters)

*p<.05 **p<.01 ***p<.001

Results for the two different models in Table 34.1 showed that level of abstraction of the definiendum affected both groups of age, but the effect was higher on children compared to adults. Therefore, a change in the level of abstraction of the definiendum made more difficult for children, compared to adults, to include in their definiens semantic content with a higher definitional power. In other words, it was much more difficult for children to include definitional features in the semantic content of their definiens than for adults.

Although we received a significative interaction effect between age and morphological category for verbs vs. nouns, the simple slope per each group was not significant. That is, even though there are differences between the definitional power of the semantic content of verb definiens between children and adults, this difference did not reach a significant effect.

4.5.3.3.1 *Cummulative Probability for the Semantic Content of the Definiens*

To complete the analysis of the definitional power of the semantic content of the definiens, we calculated the cumulative probability of students' definiens being in a certain category of the semantic content ordinal scale. These probabilities were calculated for different students, characterized by deviation from the mean, to show how different characteristics of students and words represented different probabilities to be on a specific category in the semantic content of the definiens ordinal scale, and how the cumulative probability varied across different students and words. The probabilities for the mean are shown in the first column (noun). Given that all continuous variables were centred around the mean, the probability for an average student was related to nouns. The constant shift in these probabilities reflected the effect of the morphological category of the definiendum. Age effect was illustrated by the younger and older ages, and the effect of level of abstraction of the definiendum was illustrated by the low level and the high level of abstraction. Table 35 presents these cumulative probabilities for the different morphological categories, the age and the level of abstraction of the definiendum.

Table 35

Predicted Cumulative Probabilities for the Ordered Categories of the Semantic Content of the Definiens

		Morphological Category			Age		Abstraction	
MC	Scale Levels	Nouns	Adj	Verbs	Children	Adults	Low	High
Noun	Deixis & Tautology	1	1	7	1	—	—	4
	Contextual	16	13	47	16	—	6	36
	Sindef	79	80	45	79	18	81	58
	Definitional Features	4	6	1	4	82	13	2
Adj	Deixis & Tautology				1	—	—	3
	Contextual				13	—	5	30
	Sindef				80	15	79	65
	Definitional Features				6	85	16	2
Verb	Deixis & Tautology				7	—	2	19
	Contextual				47	1	25	60
	Sindef				45	44	70	21
	Definitional Features				1	55	3	—

Note. The values represent mean percentages for each level of the ordinal scale.
Dashes indicate lack of answers for that level of the ordinal scale.

Results from table 35 showed that the cumulative probability for children to include definitional features in their noun, adjective and verb definiens was lower than for adults. Specifically, adults' definitions contained semantic content with a higher definitional power (definitional features) compared to children. Children's definiens, with the exception of verbs, had a very high probability of expressing semantic content through a synony, through descriptive characteristics or properties of the definiendum, or through the function fulfilled by the definiendum (78% and 80%, for nouns and adjectives, respectively). In the case of verbs, children's definiens had a high probability of expressing semantic content through contextual features (47%). On the other hand, definiens produced by adults had a very high probability of including semantic content expressed through definitional features (82%, 85%, and 55%, for nouns, adjectives and verbs, respectively).

The cumulative probabilities for the ordered categories of the semantic content of the definiens presented in study 2 for adults, showed that the highest category of the semantic content of the definiens for nouns, adjectives and verbs was a synonym, descriptive characteristics or functional features. Likewise, we saw that when the level of abstraction of the definiendum was low, adults' definiens for nouns, adjectives and verbs always included definitional features. This difference between the cumulative probabilities of study 2 and the results of the definitional power of the semantic content of the definiens for nouns, adjectives and verbs showed in Table 35 is due to statistical reasons, and the result is mediated by the results of children. Meaning that including the whole sample of students for this analysis caused this little variation in the results, without invalidating the results obtained for the cumulative probabilities of study 2.

These trends provided support to the results presented in Table 34, which showed main effects of age and level of abstraction of the definiendum.

Summary of Analyses and Results for Study 3

Analysis Performed	Objective of the Analysis	Obtained Results
Multilevel binary logistic regression	Test the probability of the students answering don't know (testing word definition success)	• Older students have less probability of answering *don't know*. • The higher the abstraction the higher the probability of answering *don't know*. • Higher probability of *don't know* for verbs compared to nouns (only by itself, no effect of morphological category for model 3) • Words explain higher percentage of variance than students.
Multilevel regression	Testing mean variance on the syntactic dimension	• Older students present lower variance (because older students have more answers in the highest categories of response) • Higher variance for words with a higher level of abstraction. • Verbs present less variation than nouns (because higher percentage of *don't know* for verbs). • Interaction between the age and the level of abstraction
Multilevel ordinal logistic regression	Predicting the probability of a syntactic structure in the definition	• Older students are in higher ordered levels of the syntactic complexity scale. • No effect of level of abstraction. • Adjectives less difficult to define than nouns. • Percentage of variance is higher for students than for words. • Interaction between age and the morphological category of the definiendum.

Summary of Analyses and Results for Study 3

Analysis Performed	Objective of the Analysis	Obtained Results

Cumulative Probabilities for the Syntactic Complexity of the *Definiens'* Structure	Calculate the probability of answer for each level of the scale	• Morphological Category:
		  o Presentence Structures for N, A and V. Adjectives have a higher percentage for the higher ordered categories (complex sentence and relative clause) than nouns. Even though the highest percentage is found in Presentence Structures for both morphological categories (N and Adj)
		• Age:
		  o Children: Presentence Structures for N, A and V
		  o Adults: Relative Clause for N, A and V
		• Abstraction:
		  o Low: Presentence Structures for N, A and V
		  o High: Presentence Structures for N, A and V. Adjectives have equal probability for presentence and for complex sentence (31%)

Multilevel ordinal logistic regression	Predicting the probability of the categorical term	• Older students are in higher ordered categories. • Higher abstraction brings lower level in the categorical term scale. • Verbs more difficult to define than nouns (morphological category in model 2: adjectives and verbs more difficult than N). • Students explain higher percentage of variance than words. • Interaction between age and the morphological category and between the level of abstraction and the age.

Cumulative Probabilities for the Categorical Term of the *Definiens*	Calculate the probability of answer for each level of the scale	• Morphological Category:
		  o Relational Term for N and A. Absence of CT for Verbs.
		• Age:
		  o Children: Relational Term for N & A. Absence of CT for V
		  o Adults: Hyperonym for N, A and V (with very high %)
		• Abstraction:
		  o Low: Hyperonym for N & A. Relational Term for V
		  o High: Absence of CT for N, A and V

Summary of Analyses and Results for Study 3

Analysis Performed	Objective of the Analysis	Obtained Results
Multilevel ordinal logistic regression	Predicting the probability of the specificity of the hyperonym	• Older students are in higher ordered categories of specificity • Higher abstraction brings lower level in the specificity of the hyperonym • Adjectives and verbs have lower probability to be defined with a high specificity hyperonym than nouns. • Words explain higher percentage of variance than students. • Interaction between the age and the morphological category and between the level of abstraction and the age.
Cumulative Probabilities for the Specificity of the Hyperonym	Calculate the probability of answer for each level of the scale	• Morphological Category: o Low Specificity Hyperonym for N, A and V. Nouns have a higher % of answer in the middle and high level of specificity compared to adjectives and verbs. • Age: o Children: Low Specificity Hyperonym for N, A and V o Adults: High Specificity Hyperonym for N, A and V • Abstraction: o Low: Low Level of Specificity for A and V. Nouns have the same percentage (45% for each level) for low specificity and for middle specificity o High: Low Level of Specificity for N, A and V
Multilevel ordinal logistic regression	Predicting the probability of semantic content of the *definiens*	• Older students are in higher ordered categories of semantic content • Higher abstraction brings lower levels in the semantic content • Model 2: verbs more difficult to define than nouns (model 3: no effect of the morphological category) • Words explain higher percentage of variance than students. • Interaction between the age and the morphological category and between the level of abstraction and the age.

Summary of Analyses and Results for Study 3

Analysis Performed	Objective of the Analysis	Obtained Results

Cumulative Probabilities for Semantic Content of the *Definiens*	Calculate the probability of answer for each level of the scale	• Morphological Category:
		  o *Sindef* for N and A. Contextual for V
		• Age:
		  o Children: *Sindef* for N and A. Contextual for V
		  o Adults: Definitional Features for N & A. *Sindef* for V
		• Abstraction:
		  o Low: *Sindef* for N, A and V
		  o High: *Sindef* for N and A. Contextual for V

Multilevel ordinal logistic regression	Predicting the effect of syntactic complexity on: the categorical term; the specificity of the hyperonym; and on the semantic content of the *definiens*.	• An increase in the syntactic complexity of nouns, adjectives and verbs definitions entails an increase in the semantic complexity of the categorical term; the specificity of the hyperonym; and on the complexity of the semantic content of the *definiens*.

4.6 Discussion

The primary purpose of this study was to assay the contrast between an early and evolving stage of definition by primary schoolers and an adult-like stable state of definition by drawing a comparison between children and adults' definitional abilities. Therefore, the results of this study helped us to determine, in a more systematic way, the differences observed in the two previous studies. To that end, we confronted children and adults' definition performance on nouns, adjectives and verbs, taking into account both dimensions of word definition, syntactic and semantic. We expected to find variations in the syntactic and semantic dimensions of the *definiens* that children and adults produced as a function of age.

As predicted, this study showed that there was a generalized effect of age on the syntactic and semantic dimensions of word definition. We also found significant interactions between age and morphological category of the definiendum for the syntactic dimension of the definition; and significant interactions between age and morphological category of the definiendum, and between age and level of abstraction of the definiendum for the semantic dimension of the definition. In the following lines we elaborate on each of these findings.

Concerning the effect of age in the syntactic dimension of the definition, we found that even though children used all the possible syntactic structures on the scale of syntactic complexity (even relative clauses) to define nouns, adjectives and verbs, overall, they used syntactic structures of a lower complexity in their definiens, compared to the structures exhibited by adults. While children used higher percentages of pre-sentence structures to define nouns, adjectives and verbs, adults consistently used a relative clause. The results for adults in this study present a little variation from the ones presented in study 2 regarding syntactic complexity of verb definiendums. Study 2

showed that adults defined verbs with complex sentences, while the results for the present study have shown that adults define verbs with a relative clause. This change in the result for verbs might be explained by the effect of the results of children in the statistical analyses performed on the whole sample of students in study 3.

Results for the interaction in the syntactic dimension of the definiendum showed a significant interaction effect between age and morphological category of the definiendum. The effect of morphological category for verbs (compared to nouns) was higher on adults compared to children. One could wonder how verbs can be more difficult to define for adults than for children. This result might seem surprising at first. However, and going back to the results on the syntactic complexity of the definiens from study 1 and 2, we now know that children define every morphological category with the same syntactic structure (a pre-sentence structure), while adults only define differently verbs (with a complex sentence), as opposed to nouns and adjectives, which they define with a relative clause. Complex sentence structures are placed at a lower level in the scale of syntactic complexity than the relative clause. Thus, the reason why verbs are more difficult to define compared to nouns only for adults, but not for children.

In the same line, age of the participants affects every component of the semantic dimension of the definition. As for the effect of age in the categorical term of the definiens, we found that children include relational terms to define nouns and adjectives, and do not include a categorical term to define verbs. Adults, on the other hand, always include a hyperonym to categorize noun, adjectives and verb definitions.

Interaction results for the categorical term of the definiens showed that the effect of the morphological category of the definiendum *verb* compared to *noun* affected both children and adults, but the effect was higher on children compared to adults. Therefore,

verbs (compared to nouns) were more difficult to define, in terms of the inclusion of a categorical term in the definiens, for children than for adults. In addition, the level of abstraction of the definiendum affected both groups of age, but the effect was higher on adults compared to children. As a result, a change in the level of abstraction of the definiendum made more difficult for adults, compared to children, to include in their definiens a categorical term placed in higher levels of the scale.

This result may be explained by the effect of the level of abstraction on adults' categorical terms. A close observation of the results of the cumulative probabilities for the categorical term of the definiens in studies 1 and 2 reveal that, regardless of the level of abstraction of the definiendum, children categorize nouns and adjectives with a relational term (e.g., un *asno* 'an ass' for the definiendum *burro* 'donkey') and they do not include a categorical term in their definitions of verbs. On the other hand, adults categorize nouns and verbs with hyperonyms and adjectives with a relational term, but, while a change in the level of abstraction of the definiendum does not affect the outcome for nouns, it does affect adjectives and verbs. When the level of abstraction of the definiendum is low, adults categorize adjectives with an hyperonym. Conversely, when the level of abstraction of the definiendum is high, adults categorize verbs with a relational term. This is the reason why results for the interaction between age and level of abstraction show that the effect of the level of abstraction of the definiendum is higher for adults than for children.

In regard to the effect of age in the level of specificity of the hyperonym, results showed that when children produced a hyperonym in their definiens, it was always one with a low level of specificity. Adults, on the other hand, always used hyperonyms with a high level of specificity.

Interaction results for the level of specificity of the hyperonyms showed that the morphological category of the definiendum affected the level of specificity of children's hyperonyms. Conversely, the level of specificity of adults' hyperonyms did not change as a function of the morphological category of the definiendum. In addition, the level of abstraction of the definiendum affected both groups of age, but the effect was higher on adults compared to children.

This result might be explained by the effect of the level of abstraction of the definiendum on the level of specificity of adults' hyperonyms. A close observation of the results of the cumulative probabilities for the categorical term of the definiens in studies 1 and 2 reveal that, regardless of the level of abstraction of the definiendum, whenever children use a hyperonym in their noun, adjective and verb definitions, the level of specificity of this hyperonym is always low. On the other hand, whenever adults categorize nouns and verbs with hyperonyms, the level of specificity of these hyperonyms is always high. While a change in the level of abstraction of the definiendum does not affect the outcome of the level of specificity of the hyperonyms for children, it does affect the outcome of this dependent variable for adults. When the level of abstraction of the definiendum is low, adults always categorize nouns and verbs with high level of specificity hyperonyms. Conversely, when the level of abstraction of the definiendum is high, the percentage of use of hyperonyms with a high level of specificity in nouns and verbs decreases dramatically. This is the reason why results for the interaction between age and level of abstraction show that the effect of the level of abstraction of the definiendum is higher for adults than for children.

As regards the effect of age in the semantic content of the definiens, results showed that children expressed semantic content of noun and adjective definiens through a synonym, descriptive characteristics, or through the function fulfilled by the

definiendum. While the semantic content of verbs was expressed through contextual characteristics, that is by referring to a possible context of appearance of the definiendum. Adults, on the other hand, always used definitional features to express the semantic content of noun, adjective, and verb definiendums.

Results for the interaction on the semantic content of the definiens revealed that the level of abstraction of the definiendum affected both groups of age, but the effect was higher on children compared to adults. Therefore, a change in the level of abstraction of the definiendum made more difficult for children to include in their definiens semantic content with a higher definitional power.

Finally, the last conclusion that offers our study has to do with the percentage of variance that comes explained by the characteristics of the words (i.e., morphological category and level of abstraction of the *definiendum*) and by the characteristics of the subjects (age). The results offered in this study revealed that the characteristics of the students are more important than the characteristics of the words in order to explain the differences in the performance of the syntactic complexity of the *definiens*' structure and in the categorical term of the *definiens*. However, the characteristics of the words seem to be more important to explain the differences in the specificity of the hyperonym and in the semantic content of the *definiens*.

These results for the percentage of variance explained by word level and students' level are an exact replica of the ones found for study one. However, study 2, only for adults showed that the characteristics of the subjects were more important than the characteristics of the words to explain both dimensions (syntactic and semantic) of the definition. These results might be guided mainly for the results of children, meaning that the inclusion of the whole sample of subjects for the analyses performed for study 3

facilitated a variation in the results of study 3 compared to the ones shown in study 2 for adults.

The differences observed in this study between the definitional abilities of children and adults could be explained, as some authors have argued (e.g., Snow, 1990; Watson, 1985) by means of exposure to definitions and practice. The exposure that adults have had to definitions in the oral and the written modalities exceeds the exposure of children to definitions. Consequently, we could argue that the definition is a genre that, like any other genre, needs time, practice and exposure in order to develop. The exposure of children to definitions comes from their school context, mainly by the definitions they hear from their teachers, and they might have had some practice defining words. However, it cannot compare with the practice on the genre of definition adults have had through their academic life, in which they have not only been exposed to definitions in the spoken modality through their teachers' lectures, but also to definitions in the written modality through scientific articles or textbooks. Moreover, practicing the genre of definition is a very natural activity in the academic writing, so natural that it is almost a requirement in any specialized academic piece of writing students produce, for example in the writing of essays, university papers, or in exams, to name but a few.

The results in our third study show that children have a long developmental path ahead of them to become proficient definers and give successful definitions in term of the syntactic structure and the different components of the semantic dimension.

5. GENERAL DISCUSSION

The beginning of wisdom is the definition of terms, Socrates quote that stands as epigraph of the current thesis expresses in a nutshell the importance of this task in knowledge building. In the review of the different approaches that were taken to the study of word definition (section 1.2) we have seen that this task was appreciated in classical Greece as a fundamental part of the dialectic method of reasoning; in the context of discourse studies it is considered an important tool for the transmission of knowledge and in the context of lexicographic approaches as a crucial contribution to the elaboration of dictionaries that help speakers to overcome their word knowledge limits (McKeown, 1991). This metalinguistic ability has also been extensively used for assessing and understanding children's linguistic development. Developmental studies have shown how asking children to define word can be used to gauge their semantic and conceptual development (e.g., Anglin, 1977; Inhelder & Piaget, 1964; Nelson, 1978; Norlin, 1980), to measure the development of their vocabulary and their intellectual functioning (e.g., Binet & Simon, 1916; Feifel & Lorge, 1950; Wechsler, 1974, 1991; Anglin, 1993).

In spite of the extended and diversified use of word definition most of the analyses that were carried out and the conclusions that were drawn, in particular in the developmental realm, came from defining nouns. Most studies on word definition were, to be precise, studies on noun definition. As a consequence, the syntactic and semantic characteristics of noun definition: a verbal utterance that contains a hyperonym plus definitional features in a modifying clause (relative clause) was taken as a model of formal definition. In an interesting and still to be debated epistemological twist, this type of definition was termed Aristotelian definition (McKeon, 1941) and have been

established as a developmental yardstick for word definition (Nippold, 1995; Watson, 1995).

Our initial interest on this topic was raised by the above apparently misleading generalizations: the generalized characterization of word definition ability based on speakers way of defining only one specific word category and the generalized attribution of a particular syntactic construction to a philosopher that never dealt with the syntactic form of definitions. That is why this thesis examined the way children and adults define nouns, verbs and adjectives – the three major lexical categories of Spanish – and looked deeply and systematically in the different syntactic constructions used by children and adults for defining these three lexical categories. The syntactic scale that was used for assessing the syntactic dimension of word definition was inductively constructed to embrace the different types of verbal utterances produce in response to the question *What is a X* and to capture children's performance beyond dichotomy characterization in terms of formal/ non formal definitions. Indeed, study 1 showed that 7-year-old verbal utterances for defining concrete and abstract nouns, adjectives and verbs display the whole range of possible syntactic realizations although primary schoolers defined nouns, adjectives and verbs mainly by means of pre-sentence structures. Adults, in contrast defined concrete and abstract nouns with a relative clause, but also adjectives were defined by a verbal utterance containing a relative clause. In contrast verbs were defined by means of complex sentences. The **first main conclusion** to be drawn from the thesis is that we need to extend the characterization of formal definition to embrace not only nouns, but also adjectives and verbs. Formal definition for adjectives would take the same syntactic form than the formal definition for nouns. For verbs, we coincide with Marinellie & Johnson (2004) in that there is a formal structure for defining verbs just as there is one for noun and adjectives (following our

findings). The formal structure for defining verbs would be a complex sentence: a verb phrase with a modifying phrase or clause.

The formal characterization of word definition, however, is not confined to the syntactic dimension of the definiens, it embraces also a semantic dimension: the verbal utterance must include an hyperonym plus the definitional features of the definiendum. Precisely this dimension of word definition enabled the use of this task as a tool to access children's conceptual development (e.g., Benelli et al, 2006). As seen (section 1.4 and 2) developmental research has been largely focused on the presence of hyperonyms in children's utterances and on the kind of definiendum features children take into account in their verbal formulation. Thus, in this thesis, children and adult productions were analysed for their syntactic and semantic dimensions. Like for the syntactic dimension we inductively constructed an ordinal scale for the three components of the semantic dimension: (1) *use of the categorical term*; (2) *specificity of the hyperonym*; and (3) *semantic content of the definiens* that enable to a full portray of the ways in which children (and adults) express taxonomic relations and definitional power. Together the syntactic and the semantic scale provide useful instruments for future developmental studies on word definition and proved to be extremely useful for capturing the effect of lexical category on the syntactic and dimension of definition.

The **second main conclusion** to be drawn from the thesis is that the morphological category of the definiendum had a different effect on the semantic dimension of definition in children compared to adults. In children it affects every component of the semantic dimension of the definition: use of the categorical term; specificity of the hyperonym; and semantic content of the definiens whereas in adults it affects the use of the categorical term and its specificity but not its semantic content. In

order to interpret the differential effect of morphological category on the semantic dimension we need to take into account the level of abstraction of the definiendum.

In effect, level of abstraction of definiendum was another factor we included in the study based on findings by McGhee-Bidlack, 1991 and Nippold, Hegel, Sohlberg, & Schwarz, 1999. To operationalize this variable, we carried out a separate study based on subject's judgements of the words used in the three main studies. Against our expectation however we have found that level of abstraction only explained the differences in the components of the semantic dimension both in children and adults. The effect of this variable on the syntactic dimension is subtler. Among the youngest age group, level of abstraction facilitates the realization of more complex syntactic structures whereas among adults it guides the effect of morphological category. For example, only adjective showing a low level of abstraction were categorized with hyperonyms; the semantic content of nouns, adjectives and verbs was expressed by definitional features when the level of abstraction of the definiendum was low. The **third main conclusion** to be drawn from the thesis is that level of abstraction of the word to be defined has a stronger effect on the semantic dimension than on the syntactic dimension of definition either directly, in the youngest age group or indirectly through the morphological category of definiendum among the oldest participants. The effect of the level of abstraction of the definiendum is higher for adults than for children.

The analytical strategy followed in the different studies enabled us to systematically analyse the effect of the morphological category and the level of abstraction of the definiendum, together with the effect of age. Although the participants were in the same school level – first grade- the range in chronological age of the participants allowed to assess the effect of age. This is very relevant because it offered the possibility to disentangle – the effect of age from the effect of schooling two

variables usually confounded in literate communities (Tolchinsky, 2004; Nippold, 2004; Berman, 2004). A most interesting finding is that there was an effect of age in the complexity of syntactic structures but age affected only mildly the semantic components of the definition. A higher percentage of syntactic structures of higher complexity were found in older children compared to younger ones. Based on this finding we suggest **a fourth but tentative conclusion:** cognitive factors might have an enhancing effect on the syntactic dimension of children's definitional abilities, independently from schooling. This suggestion deserves a careful study to explore more directly the relation between definitional abilities systematically assessed and cognitive abilities.

Being able to analyse in one model at the same time the variance coming from words and the variance coming from the students allowed us to reach better and more systematic conclusions regarding the effect of characteristics of the students and the words on the syntactic and semantic dimension of word definition. The **last conclusion** that offers our study has to do with the percentage of variance that is explained by the characteristics of the words (i.e., morphological category and level of abstraction of the *definiendum*) and by the characteristics of the subjects (age). The results offered in this study revealed that the characteristics of the words are more important than the characteristics of the students to explain the differences in the specificity of the hyperonym and in the semantic content of the *definiens,* the two semantic components that are more dependent on literacy and world knowledge. In contrast the characteristics of the students are more important than the characteristics of the words in order to explain the differences in the performance of the syntactic complexity of the *definiens*' structure and in the categorical term of the *definiens*, the two components that might be hypothesized to be dependent on general cognitive mechanisms.

5.1 Limitations of the study

> *The time to begin writing a thesis is when you have finished it to your satisfaction. By that time you begin to clearly and logically perceive what it is that you really want to say.*[7]
>
> —Mark Twain, Notebook, 1902–1903

As any piece of research this one has several limitations. In the first place, because we had only two age groups – children vs adults – we are constrained in the developmental picture we can draw. In order to trace the development of notational abilities it is necessary to have at least two other age groups between the initial and evolving stage and the adult stage. Previous studies have shown the development of definition is a protracted development (Nippold, 2016). We now have at our disposal the suitable instruments to analyse children definitions and we hope to be able in a near future to assume this task.

Secondly, it would have been useful to have a more balanced distribution of morphological categories. Although the distribution of word categories in the current thesis reflects the distribution in the language it would have been more informative to have more verbs and adjective with an ampler range of abstraction level.

In addition to that, as we already commented, the use of cognitive predictors would have strongly enriched our findings and enable to go beyond description. In the fourth place, it could be useful to control for morphological status of the words, whether

[7] I took the liberty to slightly modify Twain's quote because I've found his saying particularly adequate to express the feeling of an author when he/she is about to complete a piece of work in which he/she has invested full effort and personal involvement.

The original quote reads: *The time to begin writing an article is when you have finished it to your satisfaction. By that time, you begin to clearly and logically perceive what it is that you really want to say.*

they are basic or derived terms a factor that may have implication for definitional behaviour. Finally, a complete study of word definition should include more ecologically valid tasks apart from the metalinguistic highly decontextualized style of tasks usually utilized in developmental studies

In spite of the above mentioned limitations we hope this thesis has made a relevant contribution to the study of word definition.

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