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THE MIND IS NOT A BLACK BOX: CHILDREN'S IDEAS ABOUT THE WRITING PROCESS

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Abstract

We study children's conceptions about the content of thought when a complex cognitive activity, as is writing, is carried out. Sixty children attending Kindergarten, first grade and fourth grade in Bariloche, Argentina, were presented individually with a sequence of four questions about the content of a child's thought in four key moments of writing production (anticipating, writing, deleting, rereading) that were depicted with graphic cards. Textual analysis, with the application of FCA and Modal Response procedures, indicated significant developmental changes in the focus of children's ideas regarding writing and specifically, the intervention of thinking in writing, on the basis of the cognitive processes of increasing complexity and internalization.

Key words

child development- writing acquisition – theory of mind - thinking - conceptual change

Introduction

This work studies children's conceptions about the content of thought in four key moments of writing production: before writing, during writing, deleting and rereading. We propose that this object of study can provide a novel access to the understanding of the development of children's conceptions about two relevant cognitive activities: writing and thinking. Despite cognitive and sociocognitive processes intervening in writing production have received plenty of attention on the part of developmental and educational research (Bereiter & Scardamalia, 1987; Dyson, 1989; Flower & Hayes, 1981; Nystrand, 1982; Tynjala, Mason & Lonka, 2001; Scardamalia & Bereiter, 1991), little is known about how children who are learning to write conceive these processes.

Nowadays, there is growing agreement upon the relevance and urgency of achieving a better understanding of the learners' view of the activities that are in the core of school education (Olson & Bruner, 1996), as writing undoubtedly is. We suggest that learners' conceptions of writing processes outline a learning tacit curriculum of writing, that operates by guiding learning efforts and self-evaluation standards.

As it is well known, thinking constitutes an inherently private and invisible cognitive activity that involves a multiplicity of specific mental processes (Vygostky 1978) requiring some sort of mental contact with a content. Such content can consist of perceived, recollected, anticipated, imagined, or even fictional objects. From a slightly different stance, objects of thought can be located on different points of a continuum extending from an external, objective or material pole, to an internal, subjective or symbolic one. In other words, objects of thought can correspond to any branch of the "ontological tree" (Chi, Slotta, & Leeuw 1994). That is, one can think about objects that are clearly distinct from oneself, as is the case of physical "things" or of other people; or about subtle and slippery objects such as words, events or situations; or even about objects that can be only indirectly acceded to, such as mental representations or even mental processes. It is especially interesting to analyze how children conceive thought processes intervening in cognitive activities such as learning (Pramling, 1996), drawing (Scheuer, de la Cruz & Pozo, 2002) or writing, as is the case of the present study.

From the psychologists' view of writing to the children's view

It is widely accepted that writing production is a complex, non-linear process that requires and enhances regulatory mental activities, such as planning, monitoring, revision and evaluation (Flower & Hayes, 1981; Olson, 1994; Bereiter & Scardamalia, 1987; Scardamalia & Bereiter, 1991). During the past three decades, many

researchers have studied how these processes, which operate in recursive ways in experts' writing production (Jitrik, 2000), develop as the learning of writing proceeds. Already preschoolers speak spontaneously of what they are thinking about as they write (Goodman, 1996). Many studies have documented that even early writing attempts are regulated by ideas about what may be written in different situations, what characters are to be used and what kind of combinations are allowed for (Baghban 1990; Ferreiro & Teberosky, 1979; Pontecorvo & Orsolini, 1996). The degree of cognitive control over writing production is influenced by various factors that interact, including cognitive development, specific learning, learners' motivations and goals, educational context for production and revision (Mateos, 2001; Nystrand, 1997).

From an early age, children use to participate in different notational practices, in an emergent literacy process (Sulzby & Barnhart, 1992; Borzone de Manrique, 1994). Around the age of two or three, children begin to produce scarcely controlled graphic forms. As these forms give way to recognizable figurative drawings, attempts to write names of persons and of objects tend to become distinct as well. By the age of four or five, children become increasingly interested in writing and begin to integrate pertinent production principles (Ferreiro & Teberosky, 1979). Young children use their writing, even when it is not conventional, to mark their drawings, to communicate with others and influence their behavior, to represent aspects of situations, etc. Despite the precocious distinction between iconic and alphabetical forms (Martí, 1999), children frequently combine both of them in varied ways: writing is used to title and identify drawings, and drawing is used to complete writing (MacLane, 1993; Sulzby & Barnhart, 1992). It has been found that older children refer to this early relation between writing and drawing retrospectively: in talking about how

they have learnt to write, most children in ages five to ten anchored the emergence of writing in their earlier practice of drawing (Scheuer, de la Cruz, Huarte, Caíno & Pozo, 2001b).

During the first years of elementary school, as the relative mastery of technical-notational aspects of writing improves (Teberosky & Tolchinsky, 1995), the centrality of drawing as a notational resource generally declines. Mastery of the alphabetical code makes it possible to shift towards new learning focuses, including orthographical rules (Matteoda, 2000), conventional formats, and even certain aspects of the intratextual relations of coherence and cohesion (Castedo, 1995; Kaufman, 1994; Teberosky & Tolchinsky, 1995). The stage model of aspects of writing and reading elaborated by Fitzgerald and Shanahan (2000), mainly agrees with the former account, and completes it developmentally. These authors propose that between nine and eighteen years of age, subjects' focus in reading and writing shifts from the learning of new knowledge, to the integration of multiple view points, and successively to the construction and reconstruction of knowledge. This developmental trend suits the well known transition proposed by Bereiter & Scardamalia (1987), from a knowledge telling model of writing (according to which writing is a matter of transcribing preexisting content into text) towards a knowledge transforming model (writing is a matter of constructing and transforming ideas to satisfy rhetorical goals). In fact, young and novice writers, as well as many adults, restrict their writing composition to tell what they know about something.

En el aprendizaje de la escritura inciden de modo crucial las prácticas educativas. Aunque éstas se inician muy tempranamente en los contextos informales en los que vive y participa el niño, sería ingenuo pensar que un sistema tan complejo y exigente como la escritura puede ser adquirido y utilizado de forma plena sin unas

prácticas educativas formales, planificadas, secuenciadas y con unos objetivos explícitos claros (Martí, 2003, p. 158). En Argentina, los lineamientos curriculares para la etapa de nivel inicial establecen como objetivo familiarizar a los alumnos con diferentes soportes, usos básicos y prácticas de escritura, asignando un papel clave a la escritura del propio nombre, en conjunción con el reconocimiento del de los pares y de otros significativos. La enseñanza de la escritura que se propone para primer grado se concentra en el dominio del código alfabético, a partir de la explicitación y ajuste progresivos de las “hipótesis” de los niños acerca de las reglas de correspondencia entre unidades del lenguaje oral y unidades escritas, según la perspectiva desarrollada por Ferreiro y Teberosky (1979). En los años siguientes el objetivo es completar este proceso e integrar conocimientos acerca de la puntuación, la ortografía y de las funciones y las características de distintos tipos de textos. El objetivo principal de la enseñanza de la escritura al promediar la educación primaria es lograr que los alumnos sean capaces de utilizar la escritura como herramienta para la comunicación del conocimiento y la expresión de puntos de vista y de emociones.

However, it is not clear how children conceive the writing process. In particular, how do they conceive the regulatory processes intervening in writing production (planning, monitoring, revision, evaluation)? Is the development of such conceptions somehow related to writing development?

The development of children's ideas about the cognitive activity of thinking

Already by the age of three or four, children acknowledge that thinking is an internal and mental activity, that has a content and requires a specific bodily substrate, i.e. the brain, located in the head (Perner, 1991; Wellman, 1990; Bartsch & Wellman, 1995). However, a series of studies (Flavell, Green & Flavell, 1995; Flavell, 1999)

show that in this period, children's understanding of thought is still very limited. In accord with the earliest theory of knowledge children operate with to establish if somebody knows something (a behavior theory, Perner, 1991), preschoolers use to reduce the thinking process to its successful results. In addition, it seems they do not account for the tendency of mental events to trigger other mental events (cognitive cueing). In relation to this, preschoolers underestimate the amount of cognitive activity people experiment and use to attribute thinking only when clear cues are at hand, e.g. when a person assumes a stereotypic thinking pose or is solving a problem explicitly presented as such. The attribution of thinking activities increases considerably between the ages of five to seven, though difficulties to infer the content of thought still persist. A study of the similarity relations eight- to eleven-year-old children as well as adults establish among a large set of mental verbs offers clues of the development of the early conceptions of thinking (Schwanenflugel, Fabricius & Noyes, 1996). It was found that all age groups organized mental verbs according to two main dimensions: certainty aspects of mental activities and information processing phases. Results indicate that in middle childhood and adulthood, thinking is conceived as an activity of manipulation or elaboration of information, involving an intermediate degree of certainty.

It has been proposed that children's conceptions about the origins and representational nature of mental states and mental processes are organised as implicit theories that accomplish important functions in the subject's relation with the environment, such as explanation and prediction (Astington & Gopnik, 1991; Perner, 1991; Wellman, 1990). Hence, children's conceptions about specific mental processes, such as thinking, would be based on their more general theory of mind (Montgomery, 1992).

The development of children's theories of the epistemic and learning mind

Wellman (1990) has argued that already from the age of three, children count on a very simple representational theory of mind, a *direct copy theory*, according to which persons' knowledge is a faithful portrait of reality. This early theory indicates a first, elementary distinction between knowledge and reality, despite it ignores the means whereby knowledge is acquired. Around the age of four, children begin to consider perception as the way of access to such a copy-knowledge. This more elaborate version of the copy theory admits the epistemic states of ignorance, incomplete knowledge and inadequate knowledge, as caused by the total or partial lack of perceptual access to adequate information. During middle childhood, children begin to distinguish a greater variety of mental states (motivational and epistemic) and to integrate mental processes (deliberate observation, memory, evaluation, revision, monitoring) into what becomes an emergently *interpretative* theory of mind (Pozo & Scheuer, 1999). According to Wellman (1990), it is only in the frame of an interpretative theory that it is possible to understand that somebody may know something despite she/ he has not been in direct contact with the relevant information (due to inference), or that despite having been in contact with such information, an appropriate representation has not been elaborated (due to an insufficient exposure to the stimulus). A more advanced interpretative theory allows understanding that two persons can legitimately represent the same information in different ways (Carpendale & Chandler, 1996; Chandler, 1987).

In previous studies of four- to six-year-old children's theories about a specific psychological process, learning to draw, we have shown a shift from copy theories (with an emphasis on factors that act on the learner from the outside), to interpretative theories (that focus on an agent learner, who generates and activates

mental representations before, during and after learning). We have interpreted this shift as a process of hierarchical integration that involves increasing *complexity* and *internalisation of agency* (Scheuer, Pozo, de la Cruz & Baccalá, 2001a; Scheuer, de la Cruz & Pozo, 2002), in close relation to the trend posed by Dienes and Perner (1999) in their theory of knowledge as a process of progressive and hierarchical explicitation of three knowledge components: content, attitude and self. Thus, younger children talked about what they drew (*content*), whilst older children began to consider also their mental states about drawing (*attitude*). Finally, the oldest children placed their drawings in the continuity of a learning autobiographical story (*self*).

Aims

In this study we explore the development of children's conceptions about the content of thought during written production, an activity that, as we have argued, involves complex regulatory processes as planning, monitoring, revision and evaluation. We consider the following school grades: *Kindergarten*, i.e. an educational level that prepares children for learning of writing, and corresponds to a developmental period characterized by a copy-container theory of mind; *first grade* in elementary school, when writing is a fundamental educational content; and *fourth grade*, when we may expect that students master technical-notational aspects of writing, that they are beginning to focus on organizational aspects of texts and that they conceive the mind according to an increasingly interpretative theory.

We are specially interested in analyzing if, and eventually how, the processes of increasing complexity and internalization of agency, described in our studies of children's conceptions of learning to draw, intervene in the development of

conceptions about the psychological process of thinking, in a more advanced developmental period (up to fourth grade) and in a highly conventional notational field, that requires deliberate social transmission processes (writing).

Method

Subjects

Sixty children attending public schools in Bariloche, Argentina, with a relatively heterogeneous population (ranging from low to middle socioeconomic status): 20 children in Kindergarten (mean age: 5 years, 3 months), 20 children in first grade (mean age: 6 years, 5 months) and 20 children in fourth grade (mean age: 9 years, 8 months), selected at random from two classes in different schools for each grade. Children with special needs were not included. In each grade, half the subjects were girls and half boys. Consent to participate was obtained in writing from parents.

Con el propósito de tener un panorama del contexto educativo informal y formal de los niños en este campo, entrevistamos a algunos padres y maestros. El análisis de estas entrevistas (que excede el marco del presente trabajo y se presenta en: de la Cruz et al., 2002) muestran, por una parte, que en los padres reconocen que el aprendizaje de la escritura de sus hijos se inició en el contexto familiar y, por otra, que la mayoría de los maestros privilegiaba focos de trabajo congruentes con los lineamientos curriculares. En líneas generales, los docentes plantearon la escritura como objeto complejo de aprendizaje y como herramienta para acceder a otros aprendizajes y evidenciar el conocimiento alcanzado. Sin embargo, por lo general no la consideraban como una herramienta para objetivar las ideas (Klein, 2000) y mucho menos para transformar el conocimiento (Bereiter y Scardamalia, 1987).

Procedure

We interviewed children individually in a quiet room at school, during approximately 15' - 20'. Interviews were taped and fully transcribed. A few introductory questions aimed at establishing contact with the child and at directing his/her attention towards the domain of writing (i.e. *Do you like to write?, When do you use to write?, Somebody writes at home? Who?, What do they write?, What do they write for?, At home, do you write sometimes?, What do you write for?, What do you do with your writings?*). The main task consisted of a sequence of four questions about the content of a child's thought when he/she was anticipating, writing, deleting and rereading a written text. Each question was supported with a graphic card depicting the child character (boy or girl according to the subject's sex) in each of the four moments of the writing process. The sequence was:

- *Now the child is about to begin to write a story or a letter for his relatives, who live far away. What might she/he be thinking about?* (Upper card on the left).
- *Now the child is writing. What might she/he be thinking about?* (Upper card on the right).
- *Now the child is rubbing out something she/he has written. Why does she/he rub out? How has she/he realised she/he ought to rub out?* (Lower card on the left).
- *The child has finished writing the story/ letter and she/he is reading it. What might she/he be thinking about? What is she/he looking at?* (lower card on the right)

---- Insert Figure 1 around here ----

Method of analysis

We have applied the method of textual data, or lexicometric method (Bécue, 1991; Lebart & Salem, 1994), to the 60 individual textual responses to the four-question sequence in the main task. The programme SPADT (Système Portable d'Analyse des Données Textuelles) was used. This method has proved adequate to analyse children's oral responses to open questions (Bécue, Lebart & Rajadell, 1992; Bose & Wendt, 2000) and, in particular, to infer children's and adults' conceptions about processes of acquisition and transmission of knowledge (Baccalá & de la Cruz, 2000; Scheuer, de la Cruz & Pozo, 2002). Since the use of the lexicometric method might be scarcely known in developmental and educational psychology, we briefly inform how it proceeds.

1. *Construction of a lexical table and simple factorial correspondence analysis of that table.* The lexical table is a contingency table where columns correspond to all the different words that form the corpus (without any kind of *a priori* selection) and rows correspond to all individuals (60 children in the present study). Simple factorial correspondence analysis (FCA) of the lexical table allows to view the associations between contributive subjects and contributive words (i.e. words with a contribution to each axis that is higher than the mean one) on a factorial plane.
2. *Construction of a lexical aggregate table and FCA of that table.* On the basis of the associations of contributive words and subjects resulting from step 1, we grouped the texts for the lexical aggregate table according to the modalities of the variables school grade and sex (i.e., text modalities). Rows were formed with all the different words appearing at least 10 times in the corpus, and columns were formed by the complete textual responses produced by all the subjects in each school grade and in each sex category. The FCA also allows viewing the associations between

contributive words and text modalities on a factorial plane and hence, to define lexical groups.

3. *Automatic selection of modal responses.* In the case that step 2 shows differences among text modalities, by associating each of them to a distinct set of contributive words, it is useful to study the complete responses that are typical of each modality. This is obtained by means of the Modal Response procedure, that selects the complete typical responses corresponding to each modality in decreasing order, by calculating the lexical average profile of the subjects that correspond to such modality (chi square criterion). This procedure allows to situate the contributive words identified in the step 2 in their context of production and, hence, to complete the description of the lexical groups.
4. *Qualitative description of the lexical groups, on the basis of steps 2 and 3.* This description was oriented to capture the following dimensions: content of thinking before writing, when writing, deleting and rereading; nature of error; causes of error; type of notational product; function attributed to others. *In using this method, categories for each dimension emerge from the contrasts among the modal responses that characterize each group.*

Results

The corpus is formed with 4253 total words and 621 different words, with diversity index=14.60%. The aggregate lexical table was formed with the five text modalities (three corresponding to school grade and two to sex) and the 74 words left after threshold =10 was applied. Inertia was 0.1501.

---- Insert Figure 2 around here ----

The analysis of the position of words and text modalities that are contributive to Axis 1 (underlined in Fig. 2) shows a developmental-educational ordering. This axis shows a major distinction between Kindergarten and Grade 1 on the one hand, and Grade 4 on the other. The words associated to Kindergarten and Grade 1 suggest a focus on isolated written units (*letters*), observable, unspecific actions (*to do/make*), first person absolute knowledge (*I know*) and reference to present, factual situations. Instead, words associated to Grade 4 indicate a focus on lexical written units (*word*), specific actions (*wrote*), a quest for knowledge (*how...?*, *what...?*), reflexivity (*to/for him/herself*), reference to past, present and near future temporal frames (*wrote, put, is going to*) and to a world of possibilities (*if, can/might, or, some, something, things*). Analysis of the position of words and text modalities that are contributive to Axis 2 (marked with a vertical dash in Fig. 2) establishes a distinction within the two earlier school grades: Kindergarten and Grade 1. Words associated principally to Kindergarten indicate a focus on the accumulation of writing products (*another, came out*) that include communicative texts (*letter*) and absolute assessment (*wrong, alright*). Instead, words that are associated to Grade 1 suggest a focus on a soldered, nominal kind of written unit (*name*), reference to scaffolded writing activity (*mum, she, I, my*) and the establishment of comparisons with conventional standards (*like this, as*). Sex modalities are not associated to distinct sets of contributive words in either axis, and hence will not be considered further.

We distinguished three lexical groups in the factorial plane. Since each of them is associated to a different school grade, we proceeded to apply the Modal Response procedure for this variable. We now turn to the qualitative description of the lexical groups, which includes the corresponding list of contributive words

(resulting from AFC) and literal excerpts of typical textual responses (resulting from Modal Response procedure). Excerpts appear in brackets, with a slash separating those corresponding to different subjects.

Group 1: Characterized principally by the words *an* (m.), *another* (f., sing.), *eh* (interj.), *letters*, *letter* (as a communicative text), (to) *do/make*, *for*, *to/for him/her*, *came out*, *wrong*, *alright*, *thinking* and by subjects in Kindergarten. Children in this group express that the content of the character's thinking before he/she starts writing is oriented to the materials used to produce and conserve writing, and mark adults as providers of such materials (*for example, to make a letter I need an envelope and my dad doesn't want to give me one*). These children express that when the character is writing, his/her thinking concerns the choice of an addressee (*she might be thinking whom to send the letter to*) and the type of notational product. Notational products referred to include drawings, isolated letters and communicative messages (*I miss you Grandpa, I miss you Uncle // that you get on well in Buenos Aires*). These children explain that the character rubs out to correct written products, which he/she has identified as completely mistaken through visual perception (*'cause he saw that it all came out wrong*). Comparisons with a standard of some kind, as well as the naturalization of error as an inherent part of the writing activity, seem to be underlying this kind of appreciation. Correction consists of deleting such erroneous products and doing them all over again. External causes are invoked for such mistakes (*then she was seeing the letters and then a noise... and she did it the other way round* (i.e. she produced an inverted letter)). These children spontaneously mention the material and mental risks for the continuity of writing posed by deletion (*cause if she rubs out a lot, the sheet's going to break // everything is rubbed out and now he doesn't remember anything*). These children express that when the character reads what she/he has

just written, thinking is oriented towards the visual identification of recognizable unconnected wholes (*she looks at the letters and then she looks for the 'a', the 'o', the 'j'*). In this final moment, thinking also deals with actions and material objects that close the writing sequence in a concrete, physical dimension (*and then he's going to put tape on both sides and then he glues it*) and with the impact child-made written products can provoke on the adult, who legitimates it as writing (*so my dad realizes that I wrote the letters*¹).

Group 2. Characterized principally by *name, mum, she, his/her, I, my, (to) think, (to) write, writes, like this, the* (sing., m. and f.) *of, (I) know* and by subjects in Grade 1. Children in this group permanently refer to the child's need of scaffolding by a competent adult in the family, who is requested to provide information about the alphabetical code (*'cause his mum can tell him how to write this*) and to correct the text as the child is writing or once he/she has finished. In relation to the content of thinking before beginning to write, children speak about the character's need to comply with the social expectancy to acquire writing at his/her current age (*she thinks that she must write the homework and she must help her brothers (...) cause I'm six and she's six // there she's crying 'cause she doesn't know to write*). Children attribute the character anticipations of different levels of complexity. Punctual anticipations specify very diverse kinds of notational products: free drawings, copying pictures or photographs, tagging the drawn object by writing its name (*she thinks of writing words or drawings, of making a sweet potato and writing the name of the sweet potato*) and even complex written texts. Referents, topics and genres are stated, including elaborate fictional narratives (*I think he's weaving something, a story of terror or a nice story*). Other anticipations consist of quantitative evaluations of the projected written product (*it's a short word // lots of things to make a story*), or reveal

concern with the adjustment to the alphabetical code (*with 'bu', with the 'b'*) or to conventional textual formats (*before (writing) the day he's gonna think, 'cause the day is always at the beginning*). These children express that when the character is writing, his/her thinking concentrates in letter and word production procedures. They describe the mental procedure of deliberate auditory segmentation of the voiced word and the subsequent, step by step coding of such parts until the writing of the complete word is achieved (*suppose he wants to write 'cuento' (story) and he repeats lots of times to see with which it is that it begins, he'd repeat 'cue... to', 'cuen... to', 'cuento'*). Children in this group say that the character rubs out in order to correct the words and letters he/she has recognized as mistaken, by comparing them mentally with writing models and rules (*a letter he has repeated many times (in the word) came out wrong, he must repeat it twice, not more*). Correction consists in total rewriting. Children explain that mistakes are due to externally directed mental states or actions that interfere with written production (*'cause he was looking at the wall*). As for the moment of final reading, children in this group express that the character assesses his/her product on aesthetic, global terms (*she must be thinking that the story is nicer than a flower // he must be thinking how nice what he has written is*), or that he/she performs an attentive and detailed revision (*he'd look, it seems he's thinking to see if a letter is wrong*) and occasionally requests adults' help (*she's asking his mum what's written here*). These children refer the destination of the written product in material or spatial terms, by mentioning containers (*he'll keep it in his rucksack!*) or by anticipating the written product's future journey (*and the paper goes out of his house and goes there*).

Group 3. Characterized principally by *word, things, something, some, or, (to) put, (he/she) wrote, (he/she) is going to, (he/she) can/might, by/for, if, how...?, what...?*,

to/for him/herself, and by subjects in Grade 4. Across the four moments of written production, children in this group focus on alphabetical writing exclusively (without mentioning drawing) and recurrently attend to two dimensions: what is written and how it is written. They say that before beginning to write, the character thinks about meaningful, relatively complex contents and about procedural, formal and textual aspects (*what she's going to write, and how she's going to write those things // I imagine that he's thinking a story, he should think of something that makes sense, a sentence*). These children express that thought operates as a condition for writing (*he thinks what he can write. 'Cause otherwise he has no ideas to write*). They also mention the possibility of requesting factual or nominal information to an adult in the family (*if he doesn't know the name of his uncle or those things, he asks his mother*). With respect to the content of the character's thinking as he/she is writing, these children describe a relation of reciprocal enhancement between thinking and writing. Thinking orients writing as regards orthographical appropriateness (*he might be thinking if 'helado' (ice-cream) is written with 'h'*) and the elaboration of long, complete and organized texts (*how he can make up a sentence, how he can finish the story // the things he must go on with to write, 'cause some kids write up to half the letter and then they must continue downwards, and he has to think what to write in the piece that comes down (in the paper), otherwise he can't write it complete*). These children also point out that during the production phase, the character's thinking is oriented to the revision of what has just been written (*if what she has written to them is alright, if it is well written*). Writing provokes the associative recall of episodic memories. This open course of thought in turn orients, reorients, alters or even disrupts the course of writing (*and it might happen that he's writing and at a certain point he writes, for example: 'this boy's aunt is ill', and then he remembers*

that his (own) grandmother is ill and he begins to think about that and he doesn't read what he has written and begins to tell another story). Children in this group express that the character rubs out to correct text organization, as well as to repair word, letter or accent omissions, and to improve spelling and the visual presentation of the text. They also state distinctions among writing instruments according to the possibility of erasing (*if he writes with a pen he can't rub out, but with pencil he can, 'cause you can rub it out with a rubber*) and present reading as a way to identify mistakes (*'cause he was reading what he was writing and he realized that he had made something wrong, something turned out wrong, some letters, something*). As for final reading, these children express that the character qualifies the text he/she has produced from both conventional and personal stances (*if what he has written is right and if he likes it, or he wants to change it*) and checks spelling, completeness and topic continuity (*she looks if she has any orthographical mistake, or if she flew away (got distracted) and then went on writing without realizing // then she went over it and she saw she had mistaken a letter and there she rubbed out*). Just as they did in reference to the moment of writing, these children say that reading one's own text triggers associative processes and provokes memory recall (*while he gets ahead reading he thinks of his uncles and cousins*).

The main features of each lexical group are summarized in Table 1, according to the following dimensions: content of thinking before writing, when writing, deleting and rereading; nature of error; causes of error; type of notational product; function attributed to others.

---- Insert Table 1 around here ----

Discussion

Differences among lexical groups identified on the basis of FCA and Modal Response lexicometric procedures indicate significant developmental and educational changes in children's conceptions about writing and, specifically, about the intervention of thinking in this activity. In this section we specify such changes, as well as the cognitive processes involved.

To begin with, the analysis of the contents of thought children attributed to the character reveals three successive and increasingly complex ways of *conceiving writing*. According to children in Kindergarten, to write is basically to produce drawings, letters or messages to be shown or given to significant others. In Grade 1, children's major concern is to capture oral language on paper, by segmenting words into relatively stable auditory units and transcribing such units according to conventional rules of oral-written correspondence. For children in Grade 4, writing is basically to elaborate an organised and complete text that bears sense, is thematically articulated and complies with orthographical conventions and presentation standards. These successive shifts in the attributes of writing children emphasise as they advance in its learning, suggest that they gradually get deeper inside the world of writing and that, in doing so, they establish increasingly complex relations within it. Children in Kindergarten, in emphasising the visual dimension of written products, do not attend to the ways in which such products are generated, whereas children in Grade 1 (an educational level explicitly oriented to literacy learning), are worried about the ways of generating acceptable, "legal" writing, on the basis of phonological criteria. Instead, at fourth grade, once that the alphabetical code is fluently mastered, writing represents a way of expressing and generating meanings. In agreement with the fourth stage in writing development distinguished by

Fitzgerald and Shanahan (2000), which is focussed in the learning of new knowledge, the dependence of written language on oral language has become almost transparent for the children. With the advancement in the developmental – educational variable, a shift from modes of regulation guided by external, perceptual models (initially visual and successively auditory), to regulatory thinking processes, is evidenced. We consider that the above changes in the focus of the thinking contents attributed to the character are also revealing an automatization of technical-notational aspects of writing. Once that the learner has gained certainty about such aspects, they no longer occupy his or her main attention. This automatization process (Karmiloff-Smith, 1992) is crucial for the learner's appropriation of this sociocultural object. In our view, it is precisely the possibility of drawing attention away from technical – notational aspects, that allows the learner to turn to, and become conscious of, other deeper and more complex aspects of writing.

The results of the present study indicate that children's accounts of the intervention of thought in writing progress in ways that, in some senses, remind the well-known models of writing contrasted by Bereiter & Scardamalia (1987) in UNIVERSITY students (cf. Introduction). Despite there has been plenty of research regarding these models, the basic claim – that differences between ways of writing stem from different mental models of writing – has generally been inferred from differences in writing *processes* and *products*, rather than specifically from differences in *conceptions* of writing. Moreover, such models have not been thought of in developmental terms, but as cognitive styles. However, our results suggest that children's conceptions about the ways whereby thinking intervenes in writing show a developmental progression from a position resembling *knowledge-telling* model in Grade 1, in the sense that these children are mostly concerned with transcribing pre-

existing content into writing (in their case, such content is restricted to oral words or utterances), towards a position related to *knowledge-transforming*, inasmuch children in Grade 4 refer both to the content and form of text. Obviously, we are not claiming that fourth graders *write* as the expert writers described by Bereiter y Scardamalia; rather, we suggest that when they are invited to reflect about the content of thought in a writing activity, they show an emergent concern with rhetorical aspects. Esto estaría indicando un cierto *décalage* entre la capacidad de concebir la complejidad cognitiva que supone la actividad de escritura y la capacidad de integrar esos aspectos en la producción efectiva de textos escritos. In the future, it would be interesting to study how these developing conceptions relate to children's writing production.

From another point of view, results of this study indicate that with development and education, a growing emphasis is given to the *intervention of thinking in writing*. In accord with the studies by Flavell, Green and Flavell (1995) of children's understanding of thinking as a general process, we have found that the presence assigned to thinking during the writing activity increases developmentally, and that the functions considered become more variegated and complex. In effect, the answers of the youngest subjects (Kindergarten) do not contain almost any allusions to the cognitive control of thought. Children in Grade 1 refer the functions of anticipation and revision of thinking, whereas fourth-graders also express that writing promotes meaning generation processes and the recall of autobiographical experiences. For these older children, thinking is not merely a condition for writing; it is also its (on occasions unexpected) consequence. The written text and the writing process itself raise associations that might produce unforeseen deviations from the thematic thread that was guiding production up to that moment. New, two-way

relations between thinking and writing are established, and hence monitoring is conceived in more complex terms. This novel conscience of the openness and contingency of mental activity would indicate, as Wellman has suggested (1990), that in middle-childhood mind is no longer conceived uniquely in the frame of a cause-effect psychology. Moreover, the eldest children in our study recurrently relate anticipation and revision with several moments of the written production, instead of with one moment only, as is characteristic of first graders. Let us recall, for instance, that children in first grade speak of revision regarding only the moment of final rereading, whereas fourth-graders also speak of on-line revision. From first grade to fourth grade, the aspects of writing these functions deal with become more complex, congruently with the shift we have already described from an almost exclusive concern with the alphabetic code towards textual sense and organisation.

The present study also shows a process of progressive emergence and internalisation of agency in writing. In Kindergarten, the orientation to writing in terms of visual products does not require taking an agent writer into account. Agency is expressed in very limited ways, since it is concentrated in handling materials and is sustained by an adult, or shared with her. Instead, first graders' focus on written production procedures is accompanied by the permanent and deliberate search for a competent adult's help and by the manifestation of agency in various planes: transcription procedures, revision and correction, appreciation of one's own written products (in contrast, Kindergarteners attach this latter function to the adult addressee). In fourth grade, the dependence on external help diminishes and personal agency becomes stronger and deeper. Subjectivity begins to turn explicit, in terms of the recognition of internal experiences that accompany overt activity and as personal positioning with respect to one's own production. Changes in the

localisation of the causes of error provide a further and clear evidence of the process of internalisation of agency in writing: initially error is explained in terms of external irruptions, next as caused by the perception of diverging stimuli, and subsequently as due to subjective interferences in the flow of thought.

Overall, changes in what children in the three different school grades say about the content of thinking in writing production present a noteworthy coincidence with the trend of writing development as described by research in the area (cf. Introduction). Finally, the set of changes in children's conceptions regarding writing and, specifically, the intervention of thinking in writing, seem to fit neatly into the processes of growing complexity and internalisation we had proposed to explain the development of children's implicit theories about learning to draw (Scheuer, Pozo, de la Cruz & Baccalá, 2001a). This agreement would indicate that the development of children's ideas about two psychological processes, i.e. learning and thinking, hold important similarities as regards both the *content* and the *processes of change* of ideas. Children's ideas are organised according to theories of mind that proceed from a *copy* pole, to an increasingly *interpretative* one (Wellman, 1990). Having considered 10-year-old subjects in this study has made it possible to appreciate the further development of the internalisation process, leading to an emergent recognition of personal subjectivity, as the experiential and intimate reverse face of agency. In this developmental frame, the emergence of new ideas does not substitute previous ideas. Rather, as previous ideas become integrated into a broader and more complex relational net, the emphasis placed on them diminishes. Complexity and internalisation at a time require and enhance the explicitation of the subject who writes and learns to write (Dienes & Perner, 1999). The shift of focus from already achieved goals towards new goals suggests that a dynamical epistemic

conscience is operating, on the basis of the recognition of zones of mastery together with the recognition of new zones of ignorance and uncertainty.

¿En qué sentidos los resultados de este trabajo posibilitan repensar las prácticas de enseñanza de la escritura en la escuela inicial y primaria? Por una parte, pensamos que se podría alentar a los profesores a que integren, en su práctica de enseñanza, intervenciones específicamente dirigidas a que sus alumnos expliciten, revisen y redesciban sus concepciones acerca de qué es escribir y acerca de qué se piensa al planificar, escribir y revisar un texto. Si es cierto que en ocasiones estas concepciones superan a las prácticas efectivas de escritura, sería esperable que hacer estas concepciones más visibles para los propios aprendices y conectarlas con situaciones concretas de escritura potencie sus procesos y productos de escritura. Sería interesante, en estudios futuros en el aula, explorar las formas en que intervenciones educativas, concepciones de la escritura y producción escrita se potencian mutuamente. Sin embargo, para que los profesores encaucen su trabajo en esta dirección, parece necesario que reflexionen sobre los modos recurrentes en que los procesos de pensamiento inciden en su propia actividad de escritura y sobre los modos en que escribir incide en su pensamiento. Last but not least, sería también necesario que los profesores tomen conciencia que, a la vez que sus alumnos aprenden a escribir, desarrollan concepciones acerca de los fines, requisitos, contenidos y características de esa actividad. Integrar esas concepciones puede promover una enseñanza que ancle más profundamente en las perspectivas y metas de los aprendices y que explote mejor sus recursos.

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¹ This answer reveals the identification of the subject with the depicted character, as he shifts from the third person to the first.