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Chapter 4

INVENTED SPELLING AND PERSPECTIVES ON SPELLING DEVELOPMENT: THE NECESSITY OF AN INTEGRATED COGNITIVE MODEL

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ABSTRACT

There are several models about the mechanism that make pre-school children evolve regarding the quality of their invented spelling. Ehri´s teorical perspective (1997) describes the development of children's spelling skills in terms of their increasing ability to map sounds of words to phonetically appropriate letters. According to this perspective, written language is conceived as an instrument for translating oral language and phonological awareness determines the precision of invented spelling. This model neglects linguistic variables that might influence children ability to analyse the oral and written language and also does not conceive children's reflection about written code as a factor of evolution. The constructivist perspective from Ferreiro (1988), emphasizes the importance of internal conflict between different criterion about the organization of the alphabetic code. For instance, the repetition of the same vowel in syllabic phonetised writing might cause a conflict in

children's thinking with another criterion that they attaint, related with the variation of letters within the written word (e.g. Nunes Carraher and Rego (1984) cited a Portuguese-speaking child who spelled urubu 'vulture' as UUU). This conflict might lead children to analyse syllables in their phonemes and became a source for an alphabetic approach of writing. This and other conflicts are the main factor, from the point of view of this theory, for the evolution of children's conceptions about written language. However those mechanisms are described independently of children ability to analyse oral words or the frequency of words and the articulatory properties of phonemes that integrate those words. On the other hand, Polo, Kessler and Treiman (2005), think that that statistical learning skills exists from an early age. These skills are applied in learning to spell, as in other tasks. This perspective emphasizes that children's writing reflects the characteristics of the input to which they have been exposed as they try to find meaningful patterns in regularities of written language. These regularities give children information about graphical as well as phonological patterns of the language in which they reflected their very early spellings. However, this perspective never analyses the nature of children thinking and how that reflects their approach to written language. It is quite important to create a model that integrates these several contribution.

ARICLE

A large number of studies (Ferreiro, 1988; Pontecorvo & Orsollini, 1996, Robins & Treiman, 2008; Sulsby, 1989) have shown that the understanding of the abstract rules that underlie the organisation of alphabetic systems is a process that begins early on, via the informal contacts that children, little by little, make with written language. In their efforts to understand the meanings of graphic marks and via interaction with others (both peers and adults), children gradually ask themselves questions about the correspondences between objects and writing, about the graphic features of writing, and about the relationships between the oral and the written forms of language. In this way they build up unconventional ideas about the properties of writing and what it represents. Charles Read (1971) was the first author to use the concept of invented spelling while observing young children attempts to write down words. He was also the first to notice that exists some logic in children's early spelling and that logic changed over time according to children's literacy experiences. In general, he believed that invented spelling reflects a developmental progression of increasing sophistication as children become

more adept at representing in print the sounds identified on spoken words. By his own words: "some non-standart spellings represent a more advanced conception of the task or the language than others" (Reid, 1986, p.47).

Almost fourty years after, the cientific interest on invented spelling increased since the children's early spelling can be seen as a window of their concepts and skills about literacy and about the written code. From the 1990's onwards various authors (Adams, 1998; Treiman, 1998) began to point out the interest of children's invented spellings as a mean of coming to understand the alphabetic principle, but the knowledge about the written code that children reveal in their attempts at writing has often been seen as just one more indicator of phonological awareness (Mann, 1993; McBride-Chang & Ho, 2005; Vale & Cary, 1998). This last point of view is being gradually abandoned. Nowadays it became more or less consensual that engaging in invented writing leads to the appropriation of the alphabetic principle because spelling is an activity that provides an interaction between a child's capacity to segment words into phonemes and his/her use of the graphic support offered by letters with which to represent them (Ferreiro, 2002; Ouzoulias, 2001) . Several investigations have shown that invented spelling fosters phonemic awareness, since children mobilize and apply activities involving metalinguistic reflection about speech as a function of their attempts to write down words. (Alves Martins & Silva, 2006; Silva & Alves Martins, 2002; Treiman 1998) At the same time invented spelling can promote the storage of orthographic information within lexical representations, beyond learning letter names and sounds (Quellete & Sénéchal, 2008a). In a recent research, Quellete and Sénéchal (2008a) provide evidence that invented spelling was a found to be related to orthographic awareness, namely they proved that the awareness of legal characters and awareness of permissible sequences in print predicted invented spelling beyond the sizable contribution of phoneme awareness.

The relevance of invented spelling is confirmed by an intervention study where the same authors (2008b) tested whether invented spelling plays a causal role in learning to read. Three groups of kindergarten children participated in a 4-week intervention. Children in the invented-spelling group spelled words as best they could and received developmentally appropriate feedback. Children in the two comparison groups were trained in phonological awareness or drew pictures. Invented-spelling training benefited phonological and orthographic awareness and reading of words used in the intervention. Importantly, the invented-spelling group learned to read more words in a learn-to-read task than the other groups. These findings are in accord with the view that invented spelling coupled with feedback encourages an analytical

approach and facilitates the integration of phonological and orthographic knowledge, hence facilitating the acquisition of reading (Alves Martins & Silva, 2006; Quellete & Sénéchal, 2008a).

It is possible to identify in literature several theoretical approaches and qualitative research that offered a comprehensive description of children's spelling evolution and that take into account the gradual sophistication in children's early spelling attempts. Polo, Treimam and Kessler (2007) refer three current approaches to the study of early spelling development in alphabetic writing systems: the *phonological*, *constructivist*, and *statistical-learning* perspectives. These theories differ not only on the perspectives about the phases of early spelling but most of all diverge on the mechanisms behind the evolution. The two first approaches present the progression on invented spelling through a stage models while the third approach does not, because, according to their point of view "an important implication of the statistical-learning perspective is that the same basic mechanism underlies spelling acquisition throughout development. This contrasts with the idea that children move through stages whose operative principles are divorced from those of previous stages" (Polo, Treimam e Kessler, 2007 p.14).

From the point of view of evolution, and in common to the *phonological* and to the *constructivist* approaches, children evolve from an initial level where spelling is not yet determined by linguistic criterion to an alphabetic phonetic spelling. However the names and characteristics of the phases these models describe differ significantly.

Authors like Ehri (1998), Firth (1985), and Gentry (1982) represent the so called *phonological* perspective (Polo, Treimam e Kessler, 2007). From the perspective of these authors evolution on spelling reflects a progression from initial non alphabetic markings to increased proficiency in capturing a word's phonology in print, to the emergence of conventional word-specific forms.

These theorists consider that children's first spelling attempts reveal no knowledge of letter-sound correspondence. Spelling attempts appear to be a random stringing together of letters of the alphabet. This initial stage is called by Ehri as *prealphabetic* phase and by Gentry as the *precommunicative* stage. In *partial alphabetic phase* (Ehri, 1998) or *semi phonetic* phase (Gentry; 1982) children begin to conceptualize that letters have sounds that are used to represent sounds in words. A letter name strategy is very much in evidence at this stage. In *full alphabeti*c phase (Ehri, 1998) or *semiphonetic* phase (Gentry; 1982) children are able to provide a total mapping of letter-sound correspondence and provide phonologically plausible spellings but only in *consolidated alphabetic* phase (Ehri, 1998) or *transitional* stage (Gentry,

1982) children adhere to basic conventions of orthography and produce conventional spellings.

Ferreiro (1988) is one of the most representative authors from the *constructivist* approach and she analysed the invented spelling of children who had not yet received any formal teaching in reading and writing. The results of her research led to the conclusion that children's knowledge about written language evolves along a path with three essential levels of conceptualisation. The first of these levels can be characterised by the search for criterion that make it possible to differentiate between drawings and writing. Alongside this differentiation the child also works out criterion that makes a series of letters capable of transmitting a message. These criterions are the minimum quantity of letters needed to write and to read a word and the fact that one does not employ the same sequence of letters in different words. The second level involves a refining of the ways in which both qualitative (the diversification of the orders of known letters in children's attempts to write) and quantitative (the minimum number of letters required to make it possible to interpret writing) differentiation between chains of letters are achieved. This is necessary in order to ensure differences between the ways in which different words are represented. At these levels in their attempts at writing, children do not search for any correspondence between oral and written language and often spell words according to the size of the reference items — for example, by using more letters for words that refer to large items. On the third level children begin to relate oral to written language. This level begins with the search for equivalencies between letter elements and syllabic segments in words (the syllabic hypothesis). Via this type of relationship children begin to solve the problem of the correspondence between the whole of the word and its constituent parts. This conceptual level culminates in an understanding of the alphabetic nature of written language, preceded by an intermediate phase involving syllabic–alphabetic spellings, in which some of the phonemes in each word are not yet represented.

With a few differences derived from the particular characteristics of each language and with variations in the names by which the authors in question designate the various phases of evolution, this evolutionary path has been identified for a wide range of languages, including French (Besse, 1996; Chauveau & Rogovas-Chauveau, 1994; Fijalkow, 1993), Portuguese (Alves Martins, 1993), Italian (Pontecorvo & Orsolini, 1996), Hebrew (Tolchinsky, 1995) and English (Sulzby, 1989).

From a descriptive point of view, the *phonological* and the *constructivist* approaches differ in their conceptions about the nature of children's

knowledge associated to their earliest attempts of writing (when spelling is not yet determined by linguistic criterion) and on their hypotheses about the way children began to connect oral units and print.

From the *constructivist* approach perspective (Ferreiro, 1988) on the earliest stages, and through exposure to print, children become aware of a number of salient graphic features, namely they understand that writing works differently from drawing, they reject that strings of identical symbols (e.g., AAA) are appropriate for writing and they decide that a minimum quantity of letters is needed to write and to read a word. These criterions reveal children's knowledge about the graphic nature of the writing system, but are quite neglected by the phonological approach on the correspondent *prealphabetic* phase or *precommunicative* stage.

On the other hand, the syllabic hypothesis (Ferreiro, 1988) is extremely important in *constructivist* approach for developmental progression on spelling. In addition to being the first manifestation of the understanding that print represents speech; the syllabic hypothesis calls the child's attention to the phonological similarities and differences between words. However for the phonological approach the process that leads children conceptual understanding that print is connected with oral segments is related with learning letter names. As children learn about letter names and sounds, they begin to understand the sound-symbolizing function of letters in spellings. At the dawn of this understanding, children are able to represent only a few sounds in a word, generally a sound at the beginning or a sound at the beginning and a sound in the end of the word. For example, children may produce the letters *JL* for the word *jail* (Ehri & Wilce, 1985).

Evidence that knowledge of letter names helps children grasp how alphabetic writing represents speech comes from a study in which children were asked what letters would be used at the beginnings or ends of various words (Treiman, 1998). When questioned about initial letters, preschoolers were more likely to respond with the correct *b* for letter-name words such as *beach* than control words such as *bone*.

These differences are clearly associated with a different explicative mechanism that these theoretical approaches defend as the main source for the progression on invented spelling. Phonological perspective (Ehri, 1997) describes the development of children's spelling skills in terms of their increasing ability to map sounds of words to phonetically appropriate letters. According to this perspective, written language is conceived as an instrument for translating oral language and phonological awareness determines the precision of invented spelling. The fact that the coordination of these two

types of knowledge is a necessary condition if children are to understand the systematic relationships between letters and sounds (Byrne, 1998; Byrne & Fielding-Barnsley, 1991, 1993), corroborates until a certain point this model. Children in literate societies acquire many skills in both domains well before formal reading instruction begins and that might influence the nature of their invented spelling. The development of phonological awareness is intimately involved in the evolution of invented spelling and some linguistic factors referred by research in this area must be considered. For instance the articulatory properties of the phonemes in the words that they have to write can also influence the quality of children's writing, inasmuch as some phonemes are likely to be easier to isolate within the flow of speech than others. For example, according to Liberman, Shankweiler, Fischer and Carter (1974), children become aware of vowels more easily than consonants and find it easier to identify fricative consonants than occlusive ones. Treiman (1998), Byrne and Fielding-Barnsley's (1991, 1993) work shows that it is easier to train children in relation to the phonetic identity of fricatives than to that of occlusives, because it is easier to produce these sounds in isolation. At the same time, in the written form it is easier to confuse phonemes which only differ from one another in their voicing than those which are only different in their articulation (Treiman, Broderick, Tincoff & Rodriguez, 1998). These linguistic factors undoubtedly have consequences in terms of the ease or difficulty with which pre-school children mobilize conventional letters in their attempts to spell.

Nevertheless, the way in which phonological awareness and the knowledge of letters interact with one another to enhance the development of alphabetic conceptions about the written code is not yet completely clear. Quite apart from anything else, this is because in a lot of the research in this area, children are dichotomously classified as readers or non-readers without conducting additional analyses of the extent of their knowledge about written language (Ferreiro, 2002).

Phonological perspective also neglects variables related with differences in writing systems and orthographies that might influence children's ability to analyze the oral and written language and also does not conceive children's reflection about written code as factor of evolution.

The research under constructivist perspective has been influenced by the methods and theory of Piaget. According to Ferreiro (1988, 2002), cognitive development is a constructive process since it implies the reconstruction of already acquired knowledge at new levels. Piagetian's influence in this model is reflected, on one hand, on the fact that the understanding of the written code

by children requires the resolution of logic problems and, on the other hand, by the role of cognitive conflict for evolution of invented spelling. For instance, the emergency of the syllabic hypothesis is a consequence of a logic problem that children have to solve related with the relationship between all of the words they intent to write down and its constituent parts. In order to solve that problem, children began to relate the print with oral syllables, since the syllable is the natural unit of articulatition.

As referred above, the cognitive conflict is considered the main mechanism of evolution and presents two modalities: conflicts between the input from the literacy experiences and the assimilation schemata built up by the subjects and conflicts between contractions on the results obtained by the mobilization of different assimilation schemata available on children. An example of this last conflict on spelling is the repetition of the same vowel in syllabic phonetised writing (for example, Nunes Carraher and Rego (1984) cited a Portuguese-speaking child who spelled *urubu* 'vulture' as *UUU),* might cause a conflict in children's thinking with another criterion that they attaint, related with the variation of letters within the written word. This conflict might lead children to analyze syllables in their phonemes and became a source for an alphabetic approach of writing.

One of the critics that may be done to constructivist approach is that the mechanism of conflict is described independently of the children's ability to analyze oral words or the frequency of syllables and letters that integrate written words or the articulatory properties of phonemes that are part of the words children intent to write down. One important aspect that is also worthy to be criticized is that when it comes to children who spell in accordance with the syllabic hypothesis, Ferreiro (1988) does not differentiate between those who establish the letter/syllable equivalence on a purely random basis and those who choose conventional letters with which to represent one of the sounds in a syllable. In this context, the facilitating effect of letter names and their relation to children's increasing ability to map sounds in the pronunciation of words with phonetically appropriate letters is not object of discussion, namely in what concerns to the assimilation of this kind of information to the previous children's schemata. This factor is clearly important for the beginning of phonologically plausible spelling. Besides the studies in English (Mann, 1993; Treiman & Cassar, 1997) referred before, the facilitating effect of letter names has also been found in studies conducted in other languages, such as Spanish (Quintero, 1994), Hebrew (Levin, Patel, Kushnir, & Barad, 2002), and Portuguese (Alves Martins & Silva, 2001, Cardoso-Martins & Batista, 2005). For instance in the case of Portuguese the

effect is more accentuated for vowels than for consonants – the opposite to the case in English (Pollo, Kessler, & Treiman, 2005), and that might influence the frequency and the nature of conflicts children have to deal with in their attempts to write down words in syllabic phonetised writing.

In spite of the fact that they do not present a stage model, *statistical-learning* perspectives defend that statistical learning skills exist from an early age (Polo, Kessler and Treiman, 2005). These skills are applied in learning to spell, as in other tasks. This perspective emphasizes that children's writing reflects the characteristics of the input to which they have been exposed as they try to find meaningful patterns in regularities of written language. These regularities give children information about graphical as well as phonological patterns of the language in which they reflect it even in their very early spellings. This approach agrees with the constructivist idea that young children build up hypotheses about the nature of writing before they understand that letters represent oral segments, namely related with graphic features of written words.

The idea that statistical properties of printed words and spoken languages influence children's spellings early in development, gives help to understand differences on invented spellings from different orthographies. In the case of Portuguese, young Portuguese-speaking children have been reported to produce more vowel- and syllable-oriented spellings than have English speakers. Pollo, Kessler and Treiman (2005) found that Portuguese words have more vowel letter names and a higher vowel-consonant ratio than do English words. The differences that we observed are attributable to quantitative differences in the languages and their writing and letter name systems.

However, this perspective never analysed the nature of children's thinking about the written code or how that reflects on their attempts to write. The learning process that is behind the *statistical-learning* approach is the same that is present in connectionist models, which have been tested mainly on fluent reading and writing. According to this view, children seem to have a passive role since learning involves modifying the connections between the units in response to exposure to a substantial number of examples (Seidenberg, 1997). The idea that children apprehend graphic regularities from exposition to literacy experiences is quite imprecise to characterize children's cognitive attitude towards the written code.

A comprehensive theory of literacy development should incorporate the study of invented spelling and the research about invented spelling must be open to the contributions of these several theoretical approaches. One example of attempt of theoretical and empirical integration is the work conducted by

Alves Martins and Silva (2006, 2009). On their line of research, the authors tried to combine the constructivist point of view towards children reasoning with empirical research related with articulatory properties of phonemes and with statistical properties of printed words and spoken languages (in the context of Portuguese language). These authors (2006) organized various experimental studies in which they undertook intervention programmes designed to make the quality of preschool children's invented spellings evolve. More precisely, they carried out three studies (op. cit.) in which they worked with children who possessed different levels of knowledge about writing – children whose spelling still showed no sign of a relationship with the oral (grapho-perceptive spelling), children whose spelling possessed an underlying term-to-term correspondence between the number of letters and syllables, but whose choice of letters was still random (syllabic spelling without phonetisation), and children whose spelling also matched the syllabic hypothesis, but who chose the right letters (syllabic spelling with phonetisation). The intervention was similar in all three experiments and was based on the following methodology: after writing a few words, the children were confronted with the spellings of a child on the level immediately above their own (e.g. syllabic / syllabic with phonetisation), and they were asked to analyse the word orally and think what letters to use, to think about the two ways of spelling the word, to choose one, and to justify their choice. In this way metalinguistic thinking was induced at the level of speech, writing, and the relationships between them. The main cognitive activities involved were: predicting the number and the type of letters to be written, comparing the child's own spelling with spellings one level higher, evaluating which one was better, and justifying the spelling. This procedure led to a clear evolution in the quality of the children's invented spellings, and by the post-test moment many of them (particularly the ones whose initial spellings already displayed some form of correspondence with the oral) had started respecting alphabetic criterion in their writing.

This investigation was clearly conducted according to some constructivist principles since the authors stuck to the model of stages within that perspective and, at the same time, the experimental intervention with children was sustained by conflict. Using the same experimental paradigm, in recent studies, these authors (Alves Martins & Silva, 2009) tried to manipulate linguistic variables, taking into account the research conducted by *phonological* and *statistical-learning* perspectives. They, for instance, (op.cit., 2009) analyzed the impact of the characteristics of occlusive versus fricative phonemes used in writing programmes on the evolution of pre-school

children's invented spelling. This study confirmed that conducting intervention programmes that work on pre-school children's writing leads to an evolution in the children's thinking about the characteristics of the written code. On the other hand, the results indicated that the number of words in which the initial phonemes were correctly phonetised in the post-test situation was higher in the case of the children in experimental group 1 – whose writing program had used the occlusive initial phonemes *[b]* and *[p]* – than it was for those in experimental group 2 – whose writing program had used the fricative initial phonemes *[f]* and *[v]*. So we might conclude that children's conflicts and reasoning about the nature of written code are influenced by the linguistic nature of words children try to write down.

In conclusion: research on invented spelling is a very promising area since invented spelling leads children to integrate knowledge from different areas, specifically phonology, orthography, and morphological processing (Quellete & Sénéchal, 2008b) . However, it is vital to incorporate the contribution of different theoretical models in order to build up a clear picture of children's evolution on invented spelling. It must also be highlighted that by definition invented spelling is a natural process that should be encouraged in educational sets.

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