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ARTICLE

A Study of the Development of Writing Skills at the Beginning of French Elementary School

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Abstract
This article investigates the ways children begin spelling from the start of grade 1 to the end of grade 2 in France. It presents the results of a longitudinal study with 676 children faced to the complexity of French orthography and asked to write words and sentences. The corpus was analysed with regard to phonogrammic and morphogrammic principles at work in the French orthography.
Based on the literature and the specific features of the French writing system, we hypothesized that both skill types would develop as early as Grade 1 of elementary school, with lexical spelling skills developing more rapidly. The findings suggest that the development of the phonogrammic, lexical morphogrammic, and grammatical skills of pupils may take into account different variables: consistency, frequency, syntactic context within which words are used, words that can feature different morphograms or not.

Résumé
Cet article porte sur les choix orthographiques des élèves entre le début de la première année et la fin de la deuxième année de l'école élémentaire française. Il présente les résultats d'une étude longitudinale menée auprès de 676 enfants confrontés à la complexité de l'orthographe française, invités à écrire des mots et des phrases. Le corpus a été analysé au regard des principes phonogrammique et morphogrammique à l'oeuvre dans l'orthographe française.
Sur la base de la littérature et des spécificités du système d'écriture français, l'hypothèse a été émise que les deux types de compétences se développeraient dès la première année de l'école élémentaire, les compétences en orthographe lexicale se développant plus rapidement. Les résultats suggèrent que le développement des compétences phonogrammiques, morphogrammiques lexicales et grammaticales des élèves peut être lié à différentes variables : la consistance, la fréquence, le contexte syntaxique d'utilisation des mots, la variété des morphogrammes possibles.

Keywords: Spelling; development of spelling; French; phoneme-grapheme relationships; inflectional morphology

Mots-clés: Orthographe; développement de l'orthographe; français; relations phonème-graphème; morphologie flexionnelle

In a society where writing is ubiquitous in the public, professional, and private spheres, the ability to write in accordance with orthographic standards is vital and well-valued. Research has shown that it takes at least ten years to learn to write the French language (for a summary, see Brissaud & Fayol, 2018).

This article, which builds on the *Beginning reading and writing* research work (Goigoux, 2016a), presents new quantitative longitudinal data on the development of the spelling performance of French pupils at the very beginning of compulsory education – at the time when formal teaching of reading and writing starts. This exploratory study presents data collected in schools, which will be interpreted in the light of recent research on the acquisition of spelling. Our results will lead to psycholinguistic perspectives.

1. Spelling and its Acquisition

1.1. The Dual Nature of Writing Systems

Research on writing systems has generated detailed descriptions of how they function, which varies considerably, probably depending on the historical and socio-cultural context in which they emerged. Nevertheless, all alphabetic systems combine two principles, as is the case for the French language: phonography and semiography (Coulmas, 2003; Jaffré & Fayol, 2006).

According to the phonographic principle, the characters used in writing are related to units in the string of sounds; this is the case for each of the four graphemes in the word *lapin* (*l-a-p-in* pronounced /lapɛ̃/), 'rabbit'. According to the semiographic principle, the signs used have a linguistic meaning (tense, person, gender, derivative markers, etc.). The latter principle includes the blank spaces that separate words in French; for example, in *Le chat dort*, 'the cat is sleeping', two spaces allow the reader to distinguish between the three words. This also affects the final *-t* of *chat*, which is not pronounced in this case, but is pronounced /t/, when used in *chatte* or *chaton.* The final *-t* in *dort* can be found at the end of a large number of verbs in various tenses and indicates usage of the third-person singular. The semiographic and phonographic principles can more or less overlap: for example, in *il marchait*, 'he was walking', where *ai*, which corresponds to the phoneme /e/ or /ɛ/, is the marker of the imperfect verb tense, or in *je marchai* 'I walked" where the same grapheme *ai* is the marker of the simple past verb tense.

The phonography of the French language has several characteristics that are worth highlighting.

The historical development of spoken French has moved it further away from Latin, particularly in terms of vowels, with French having more vowels than Latin. It became necessary to find ways to represent these new phonemes: diacritics (accents, cedilla, umlauts) were introduced on simple graphemes, complex graphemes were also used resulting from the combination of two or even three letters (*-ou* for /u/, *-ch*

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for /ch/ for example, *-eau* for /o/). With just 26 letters in the Latin alphabet, French has 130 graphemes corresponding to about 30 phonemes.

This complexity does not seem to be a problem if the phoneme-grapheme relationship is consistent, as is, for example, the case for the /u/-*ou* relationship. However, this is not the case for the /e/-*ai* or /ã/-*an* relationships, because two or more different spellings are frequently used to transcribe the two phonemes. In addition, the value of certain letters or graphemes can vary according to their environment: *g* is pronounced /ʒ/ when used before the vowels *-e* and *-i* and /g/ when used before *-a*, *-o* and *-u*. These graphemes are named contextual graphemes.

Some graphemes are very strongly linked to a specific phoneme. For example, the relationships between /a/-*a* and /v/-*v* are very regular or "consistent" (the phoneme /a/ is almost always written as *-a*, and the phoneme /v/ is almost always written as *-v*). These characteristics of French spelling have implications for both reading and writing.

In terms of reading, a grapheme can correspond to several phonemes depending on its context, that is, depending on its position in the word: *-t* reads as /t/, which is its "basic" value *(chaton*), but can also be read as /s/ when used before *-i* in the *-tion* nominal suffix, in this case t is a contextual grapheme; *-en* reads as /ã/ in ***en****t****en****dre*, 'listen', or as /ʃ/ in *chi****en***, 'dog', but does not have a corresponding phoneme when used in the *-ent* inflexion in *entend****en****t* (3rd person of the present tense). In reading, French is relatively regular (the final *-tion* almost always reads as /sjõ/) but is much less regular with regard to writing.

Writers are frequently faced with several possible ways of writing the same phoneme, which may or may not vary depending on the surrounding graphemes: /s/ can be written as *-s* when it is the first letter of a word (*solide,* 'solid'), *-ss* or *-ç* when used in the intervocalic position (*bosse*, 'bump'; *façon*, 'way'), or as *-t* before *-ion* at the end of a word (*récréation,* 'recess'). This affects the transcription of almost all phonemes (/f/ can be written *f*, *ff,* or *ph*), in particular the spelling of vowel sounds. In other words, French is rather 'consistent' with regard to reading, but relatively 'inconsistent' with regard to writing (Peereman et al., 2007).

Phonographic and semiographic principles may overlap, and semiography may be embodied in phonography. The latter can, in fact, serve as a support for semiography. This is the case for the *-a* used to mark the simple past verb tense in *il porta,* 'he carried' in French, or the *-a* that indicates the feminine case in Italian when used at the end of the adjective *buona*, 'good'. In some languages such as Italian, this system works well – that is, a unit of the written word has a direct relationship with a unit of the spoken word (*-a* always reads as /a/). However, in French, the semiographic markers largely do not have a corresponding individual sound (the forms *marche*, *marches,* and *marchent*, 'walk', are all pronounced in the same way: /marʃ/). In addition, plural markers, which do not have a corresponding sound, differ depending on the grammatical classes*: -s* for nouns, *-(e)nt* for verbs; for example, *les marches*, 'the steps', vs. *ils marchent*, 'they walk'. Person markers can vary from one type of verb to another (*-t* and *-e* are both markers used for the third person: *il voit*, 'he sees', vs. *il envoie,* 'he sends') or from one person to another for the same verb (*je marche*, *tu marches*, *ils marchent*); thus certain graphemes, notably the *-e*, *-t,* and *-s*, have different functions. All these phonographic and semiographic peculiarities of the French language make learning to spell particularly difficult.

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1.2. Pioneering Work on "Starting to Write" and French Replications

Pioneering work carried out by Read (1986) led to the first attempts at writing by young children being considered as a heuristic object which enables us to understand how children learn the written language by using phonological and semiological information. An initial body of research, spearheaded by Ferreiro and her collaborators, sought to establish links between the different Piaget stages of development and starting to write (Ferreiro & Teberosky, 1983; Ferreiro & Gomez-Palacio, 1988). This research showed that the skills involved in the lexical and writing process, which are inherent to expert readers, require children to discover and construct their own representations of the written language. The most elaborate version of Ferreiro's model (Ferreiro, 2000), which is based on the Spanish language – a language with a relatively transparent writing system – breaks down learning to write into three main phases. The first two phases are not alphabetical: first, children gradually distinguish between writing and drawing which, second, results in them constructing a specific graphological system. Children make a fundamental step when they discover that the graphological symbols represent the spoken language, that is, meaningful oral language. Next, by striving to associate any distinct oral segment with a distinct written unit (most often one letter), the child little by little phoneticizes writing, which starts off based on syllables (one letter = one syllable), before moving on to a mix of syllables and the alphabet, before finally becoming alphabet-based. From this genetic perspective, the stages of written language acquisition are not determined by the properties of the written language, but by a child's conceptual development of the writing system.

Work of a cognitive nature is therefore necessary to conceptualize how a writing system functions. Subsequent further research and replications have deepened our understanding of the processes from the moment a child discovers the linguistic properties of a written language.

Following on from Ferreiro's work, several researchers studied children's conceptualizations of the written word in French on the basis of the invented writing approach (Besse, 1990; Fijalkow, 1993). These replications revealed differences; however, it is not known whether they are due to differences in the didactic contexts and/or the special features of the language studied. Thus, for example, the replication of Ferreiro's work on the writing of words and sentences did not identify the syllable as being central to children's discovery of the link between the oral and written language, suggesting that encoding syllables play a less important role in French written language acquisition, more focused on encoding phonemes. Similarly, already in his early work, Besse (1990) noted differences between the French children he observed and the Mexican children with whom Ferreiro worked. Nevertheless, Besse, like Fijalkow, observed co-occurring and alternative ways of processing the written words in the same child (depending on the types of tasks and problems), which led to a more nuanced picture of the psychogenetic perspective in the strict sense of the term, henceforth qualified as "tiered" (Besse, 1993). According to Besse, these different stages of development should not be understood as "an obligatory sequence through which all children pass" but rather as "general reference points" (Besse, 1993: p. 54; for an overview, see Fijalkow et al., 2009).

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Subsequently, Montésinos-Gelet (1999) proposed a descriptive model for the construction of the phonogrammic dimension of written French, providing insights into the nature of the fundamental discoveries that lead children to adopt the writing system. Thus, while Ferreiro's seminal work focused more on the moment when a child initially discovers the written word (the first two phases, known as "pre-syllabic"), subsequent replications and additional studies provided insights into what happens from the moment a child discovers the linguistic properties of the written language.

Finally, based on the definition of written French as a graphological multisystem (Catach, 1995), studies were conducted in kindergarten and Grade 1 in Quebec (Montésinos-Gelet & Morin, 2001). Their results led to a new version of the linear development model (logographic, alphabetical, orthographic) which is commonly used in the scientific literature to explain how reading and writing are learnt. In particular, they showed that references to morphogrammic aspects can be found very early on in children's metagraphic comments, for example references to singular/plural morphographic markers. David and Dappe (2013), on the other hand, focused on the links between phonography and morphography and the first orthographic spellings. They showed that young pupils may be sensitive to inflectional graphic variations from a very early age and be able to say, 'I put an 's' because there are a lot of them.' However, in first grade, the explanations given by the pupils, often of a semantic nature, show a certain linguistic diversity and remain uncertain. It is not easy for pupils to mobilize the knowledge that links grammatical categories (in particular, the distinction between nouns and verbs) and inflectional marks.

1.3. The Development of Phonographic and Morphographic Skills

Cognitive psychology has also been exploring children's writing skills since the early 1990s. This research challenges the constructivist approaches regarding the development of writing. Many studies have highlighted early sensitivity to spelling patterns or morphological regularities.

Further, cognitive studies explored in depth the phonographic and morphological knowledge used by the pupils, highlighting statistical learning linked to the graphotactic environment. This work therefore considers the specific features of writing systems and the more detailed descriptions available today, in particular thanks to the creation of vast corpora (New et al., 2004; Peereman et al., 2007). From a phonographic point of view, the skill in writing is related to the length of the word to be written and the nature of phoneme-grapheme dynamics. For example, Treiman (1993: p. 54) showed that children find it more difficult to produce responses that are consistent with the spoken language when a word is long. In addition, the nature of the phoneme-grapheme relationships may vary the level of difficulty in encoding. As far as French is concerned, Sprenger-Charolles and Siegel (1997) showed the impact of the structures of the syllables on pupils' production and reading choices in pseudoword tasks, because it affects the way each phoneme can be distinguished. Syllables with a more complex syllabic structure, less frequent in French, were more difficult both in reading and in spelling. This effect was more marked in spelling than in reading. Mousty and Allegria (1999) found that

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children in Grades 2, 3 and 5 who were weak readers used less-frequent spellings less often: for example, they primarily wrote *-s* and -ss for /s/, *-s* for /z/, regardless of the context. The weakest pupils opt for a single phoneme/grapheme match.

Some studies have highlighted early sensitivity to spelling patterns or morphological regularities, although children have not yet received explicit instruction on these regularities. For example, the phoneme /o/ at the end of a word is often spelled *-eau* (Pacton et al., 2005). In pseudoword spelling tasks, as early as second grade, young pupils are able to choose *-eau* as a final grapheme and reject it as an initial one; at the same time, they are able to choose *-ette* when it corresponds to a diminutive. As early as the third grade, they are able as well to choose *-eau* when it corresponds to a diminutive. From Grade 3 on, they show a greater sensitivity to the consonant that precedes the suffixes *-eau* and *-ette*. For example, they select the final *-reau* rather than *-feau* one which is not found in French.

From a morphographic point of view, there have been a series of interesting studies about derivative letters, which are very common in French.

Sénéchal, Basque and Leclaire (2006) and Gingras and Sénéchal (2019) were interested by words that contain letters without a phonological function. They showed that it is easier for nine-year-old children to spell a word with a silent letter at the end when it is a derivative letter. They also found that words ending with the more frequent silent *t* were easier to spell than words ending with the less frequent silent *-d* in Grade 1 and Grade 2. Pacton and Peereman (2023) studied the impact of the help provided by morphology; derivational vs. inflectional. They created an implicit learning situation with texts they proposed for reading to 56 third grade students and 56 fifth grade students and asked them to answer questions in writing. These texts included pseudowords which were presented either with two instances of the gender inflected form (inflectional group) or with two instances of one derived form (derivational group). As most of the pseudowords ended with a final silent consonant, for ecological validity, they also included pseudowords without a final letter. They found that students learned the spelling of words both with and without a silent letter. They showed that a derivative letter in the feminine helps more in Grade 3 than in Grade 5: the results were better in the 'inflectional morphology' condition for the youngest pupils.

Fayol et al. (2020) investigated the spelling of words and pseudowords ending in /i/ or /y/ with or without a final letter without a corresponding sound. It is clear that in Grade 2, pupils omit the silent final letter when it is required, and succeed by default in words without it. In Grade 3, pupils often add an *-e*, which leads to successes (*tortue*) but also to errors (*fourmie*). In Grade 4 and Grade 5, pupils tend to make words with transparent endings more complex by using the whole repertoire of possible endings. In the event of poor phonographic performance, pupils continue to simplify words beyond Grade 2.

Ardanouy et al. (2024) sought to evaluate the respective contribution of these three skills in a cross-sectional study conducted from Grade 1 to Grade 5. They worked within the framework of IMP theory (integration of multiple patterns, Treiman, 2017), which postulates the existence of three sources, or patterns, of information in learning to write: the phonological, the morphological and the graphotactic ones, including statistical learning. Ardanouy and colleagues made the

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following hypotheses of the overlapping of children's phonological, morphological and graphotactic skills as a function of the grade level: they expected 1/ the contribution of phonological skills to predominate in the first grades and decline by the end of Grade 5; 2/ the emergence of morphological skills from Grade 1 and their subsequent reinforcement; 3/ the emergence of graphotactic regularities as an early predictor of spelling. They found a relationship between the three skills and lexical spelling from Grade 1 to Grade 5. The role of phonological skill was very high at the beginning of primary school and tended to decrease as schooling progressed. Sensitivity to graphotactic regularities was stable up to Grade 4 and decreased in Grade 5. The contribution of morphological skills increased from Grade 1 to Grade 3 and at the end of elementary school, from Grade 4 to Grade 5.

Moreover, several authors have shown the cognitive effort required to produce and control writing with plural markers, even for adults (Fayol et al., 1994; Largy et al., 2004). As far as pupils are concerned, Totereau et al. (1998) showed that, at the beginning of primary school, the interpretation or understanding of the marks precedes its production; that processing of the nominal inflection *-s* occurs earlier than that of the verbal inflection; that it takes several years to master these two agreements. However, Thévenin et al. (1999) found that it is possible for young pupils to learn plural markers relatively early on. Non-marking of the plural decreases from Grade 1 to Grade 3 and is linked to grammatical categories. The most recurrent errors concern the marking of verbs for which pupils use the plural mark of nouns.

Pupils can use different skills and processes concurrently, an ability that gradually evolves throughout the course of their development and curriculum. The "overlapping waves" model proposed by Shrager and Siegler (1998) seems to represent this developmental dynamic as it models the co-availability of several "strategies" at a given time, with a distribution of use depending on context or cognitive overload. In the case of writing, this means the possible availability of logographic, phonological, orthographic or morphological treatment, with the potential existence of erroneous procedures leading to recurrent errors.

As far as English is concerned, there have been studies that apply *Triple Word Form* theory to analyse errors produced by pupils (Richards et al. 2006). This theory predicts that children learn spelling by creating mental maps of the interrelationship among the three word forms (phonological, morphological and orthographic). Based on a breakdown of pupils' errors, the errors can be split into three categories: phonological (referring to the phonographic principle), orthographic (specific knowledge of words), and morphological (knowledge related to derivational or inflectional morphology). Daffern (2017) analysed the links between these three types of knowledge in a cross-sectional study of Australian third- to sixth-graders. She found correlations between the three components, observing that the number of errors decreased for each of the components as pupils progressed up to higher school levels, and that performance with regard to morphology and phonology improved substantially between Grades 5 and 6. Nevertheless, pupils still struggled to become proficient in morphological spelling in Grade 6; they mastered inflectional suffixes (for example, *-ed* as a verb ending) before derivational suffixes (for example, *-ion*). The study by Bahr et al. (2012) showed that the number of phonological and orthographic errors decreased significantly with increasing

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educational attainment, while the number of morphological errors increased up to Grade 5. Furthermore, the spelling of homonyms remained a problem at all levels of education.

Using the same Triple Word Form theory as Bahr et al. (2012) used to describe spelling errors produced by American spellers, a study by Joye et al. (2022) on spelling errors made by French pupils from primary school in France comes to similar conclusions: a significant decrease in the proportion of phonological errors was recorded between Grades 1 and 3. In Grade 1 and 2, a relatively high frequency of phoneme substitutions, phoneme omissions, additions or inversions and errors with complex and contextual graphemes was found. The proportion of phonological and orthographic errors decreased in the older grades, whilst the proportion of morphological errors increased. Another interesting result is the discrepancy in quantitative spelling results between the dictation and text production tasks: there were many more errors in the texts. However, this work is based on a quite small corpus (194 children divided into 5 grades; 30 children in Grade 1 and 54 in Grade 2). Of the 17 words chosen for the dictation, there were no plural nouns and only four verbs: one in person 1 (*suis*, 'I am') and 3 in person 3 (*désigne*, '(he) points', *grimpa*, '(he) climbed', *accepte*, '(he) accepts'). Conclusions concerning the development of inflectional morphological skills in word dictation should therefore be treated with caution. Though the linguistic approach to this study, and the collection of data in dictation and text production situations are valuable, this study is cross-sectional, and the data collected are not sufficient to understand how knowledge develop at the beginning of primary schooling. We therefore go on lacking data for levels 1 and 2.

A study by Morin et al. (2018) aimed to explore the nature of the skills involved in producing lexical spelling (which corresponds to both the phonological and orthographic components in the two studies reported above regarding English) and grammatical spelling (which corresponds mainly to inflectional morphology). Conducted on a sample of 244 children from the Grades 3 and 5 of elementary school, the study sought to identify different acquisition profiles based on the pupils' development of lexical and grammatical orthographic performance. They found that pupils performed better at lexical than grammatical orthography, but that both improved between Grades 3 and 5. They also revealed contradictory association and dissociation profiles concerning the use of these two types of orthography, especially in Grade 3. In one dissociation case (34.4% of pupils), they observed that weak performance in grammatical orthography was associated with good, or even very good, performance in lexical orthography, whereas the opposite relationship was much rarer (four pupils, 1.64%). Higher correlations between lexical and grammatical aspects were found for fifth-graders than for third-graders. These results were obtained from a variety of tasks, some testing their lexical spelling abilities, others their grammatical spelling abilities. The authors complete and clarify previous studies and suggest retrieval of spelling forms from memory is gradually generalized, going beyond Triple Word Form theory. It also raises the question of tools for teachers and the transfer to classrooms. However, this work doesn't focus on initial learning (Grades 1 and 2) and doesn't answer the question of how these skills develop in the first two years of primary school.

Looking at the writing of pupils in Grades 1 to 2, our longitudinal data will be examined in the light of linguistic descriptions of the French writing system and research conducted to clarify the mechanisms of spelling acquisition. Considering the literature and the unique features of the French writing system, we hypothesize that both types of skills develop from the first year of elementary school, with lexical spelling skills developing more quickly, as already shown with older children. The proportion of phonological errors should decrease in different ways according to the linguistic properties of the words. We also intend to clarify the development of morphological skills, which we know is very slow in the first years of elementary school.

2. Materials and Methods

2.1. Context of the Study

This study is a little part of a bigger research about the influence of teaching practices on quality of reading and writing learning: the research "Beginning reading and writing" conducted by Goigoux (2016a) is situated in an ecological paradigm in which it is postulated that it is possible to compare the functioning of a diverse range of teaching practices and to "learn from the variety" thus described (Duru-Bellat & Mingat, 1998). This approach involves the analysis of numerous data collected on a large sample (131 teachers in Grade 1 and their 2507 pupils), representative of the diversity of contexts in which the practices studied are included.

However, the aim here is not to pursue the general objectives of the wide study "Beginning reading and writing" on the effectiveness of teaching practices. The aim of the present study is to undertake new psycholinguistic analyses on a fraction of the sample. In doing so, we are well aware that in view of the large amount of information gathered in the main study, particularly for the children assessed in phonology, comprehension and writing, it is not possible to establish an experimental protocol as rigorous as the one we would have chosen if we had only had to apprehend the scriptural dimensions of learning.

In addition, the previous coding of responses was essentially considered from the point of view of performance. From a psycholinguistic point of view, it was necessary to carry out a qualitative recoding of the responses, which we were only able to do with pupils from the classes where the authors of this article collected data, i.e. 676 pupils (see below).

2.2. Participants

The 676 pupils were spread across 42 classes in four academies: Clermont-Ferrand (16 classes, 282 pupils), Grenoble (10 classes, 167 pupils), Lyon (11 classes, 174 pupils), and Toulouse (5 classes, 53 pupils).

The data are longitudinal with three assessments of spelling ability: one at the beginning of Grade 1, one at the end of Grade 1, and a final assessment at the end of Grade 2.

The sample is composed of 53.5% girls and 46.5% boys. As regards the language used at home, 80% of the pupils spoke French, 15% both French and another language and 5% another language. Based on the parents' professions and socio-

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professional categories, the pupils' backgrounds were varied: very disadvantaged (6%), disadvantaged (36%), intermediate (35%), and advantaged (23%).

2.3. Oral Material and Test Procedure

To assess the writing skills of pupils at the beginning of Grade 1, we carried out an invented written spelling test on pupils individually. The test takes place in a room outside the classroom, with no written text around (Goigoux, 2016b: 61–63). Pupils were required to write their first name as well as three single words (*rat,* 'rat', *lapin,* 'rabbit', and *éléphant*, 'elephant') and a sentence (*Tom joue avec le rat,* 'Tom is playing with the rat') that were dictated to them. In June, at the end of Grade 1, the pupils' performance was reevaluated using an identical dictation test to the invented written spelling test used in the pre-test with one additional sentence (*Les lapins courent vite,* 'The rabbits are running quickly') to assess their knowledge and usage of plural markers. This three words and two-sentences long dictation test was carried out semi-collectively (between 6 to 12 pupils outside the classroom) at the end of the school year (Goigoux 2016b: 66–69).

To evaluate the spelling skills of pupils at the end of Grade 2, we used a test by the Direction de l'Évaluation, de la Prospective et de la Performance (DEPP; the Evaluation, Forecasting, and Performance Department of the French Ministry of Education): a dictation of six single words (*patin*, 'skate', *pâtisson,* 'squash', *capuchon*, 'hood', *récréation*, 'recess', *charitable*, 'charitable', *magnifique,* 'beautiful') and two sentences (*En été, les salades vertes poussent dans les jardins.* 'In summer, lettuce grows in gardens' ; *Les jeunes canetons picorent le blé avec la poule noire.* 'The young ducklings peck at the wheat with the black hen.'). The pupils took the test collectively, all pupils together in the classroom (Goigoux, 2016b: 76–78).

In Grade 1, the three words were chosen according to two linguistic variations:

The oral length of the words varied. *rat* has two phonemes, *lapin* four, and *éléphant* five.

The phoneme-grapheme relationships within stimuli varied. In terms of its phonogrammic characteristics, *rat* is composed of two consistent simple graphemes; the first three phonemes in *lapin* are written with a consistent simple phonogram *(l-a-p*) and the fourth phoneme with an inconsistent complex phonogram (*-in)*; in terms of its phonogrammic characteristics, *éléphant* contains one consistent simple grapheme (*l*), two inconsistent simple graphemes (*-é, -é*), and two inconsistent complex graphemes (*-ph, -an*). Overall, *lapin* and *éléphant* are inconsistent words with an inconsistent last syllable.

It should be noted that the increase in word length is accompanied by an increase in the complexity of phoneme-grapheme relationships. Therefore, it is not possible to distinguish between the individual effects of the characteristics.

Finally, the three words chosen are homogeneous in terms of syllabic construction. All are made up of Consonant-Vowel syllables (a single one for *rat* [ra], two in *lapin* [lapC] and *éléphant* [é**léfã**]). Only the word *éléphant* contains another type of syllable, with a vowel at the onset ([**é**léf**ã**])

The words dictated to pupils of Grade 2 are those of a standardized text. However, as in Grade 1, they vary according to two linguistic criteria:

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Table 1. Nature of phoneme-grapheme relationships for the six words dictated to Grade 2

	Words					
Type of graphemes	patin	pâtisson	charitable	magnifique	récréation	capuchon
simple consistent	p-a-t	p-a-t-i	a-r-i-t-a-b-l	m-a-i-f-i	r-r-a	a-p-u
complex consistent		on	ch	gn	on	ch-on
simple inconsistent			e	e	é-c*-é-t*[s]-i*[j]	c*
complex inconsistent	in	ss*		qu		

*contextual grapheme

The oral length: *patin* is made up of four phonemes, *pâtisson* and *capuchon* six, *magnifique* seven, *charitable* eight, and *récréation* nine phonemes;[1]

The phoneme-grapheme relationships: see Table 1.

2.4. Coding of Performance

The coding was carried out by the authors themselves, and great care was taken. The researchers worked in pairs and then compared their answers with those of the other dyad. After two rounds of coding and much discussions, an agreement was reached to give a unique code to every single pupils' answer.[2] Coding instructions are given below.

2.4.1. Coding of Orthographic Performance

The orthographic performance of first-graders for the three words and of the second-graders for the six words was based on the standardized spelling of the word: the maximum phonogrammic and morphogrammic lexical score for *rat* and *éléphant*; the maximum phonogrammic score for *lapin* and the six words in Grade 2. Thus, orthographic performance for writing the sentences corresponded to the standardized spelling for all words in each sentence.

2.4.2. Coding of Phonographic and Phonogrammic Performance

The phonographic and phonogrammic performance for the three words written by the first-graders and the six words written by the second-graders was coded according to five levels:

1. No response or drawing (= 0 points).
2. No correspondence with the spoken word (= 1 point): the segment produced consisted of letters and/or pseudo-letters not designated to code the phonemes of the word to be transcribed.

[1]The words *magnifique* and *charitable* end with a silent *-e*, which is not included in the phoneme count.
[2]No interrater agreement index was calculated.

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3. Some correspondences with the spoken word (= 2 points): the segment produced was not strictly phonographic or did not fully conform with the standard (one or more letters chosen for their phonic value, but processed syllabically, partially phonographically); for example: *rat* written *R* or *RE*; *lapin* written *LPPA* or *LAP*; *éléphant* written *EL* or *ELV*, *ELFELFO*, *ELEAN*.

4. Legal spelling[3] (written markings conformed with the spoken word): this level includes two sub-categories

a) Phonographic spelling (= 3 points): all the phonemes of the word were coded using a plausible phonogram (for example: *lapin* written *LAPUN*; *éléphant* written *ELEFEN* or *ÉLAIFEN*), including cases of over-segmentation (for example: *lapin* written *LA PEN*) and the rules of position governing the graphemes in the word are not taken into account (for example: *pâti**ss**on* written *pati**s**on*). These productions are called phonographic legal spelling.
b) Phonogrammic spelling (= 4 points): all the phonemes were coded with the intended phonogram (for example: *lapin* written *lapin* or *lapins*; *éléphant* written *éléphan*, *éléphans or éléphant*). These productions are called phonogrammic legal spelling.

Depending on the linguistic characteristics of the words, this coding may vary slightly:

- There is only one possible phonogram for the phonemes of the word *rat* (/r/ and /a/); therefore, it was only coded on four levels, with a maximum of three points possible (*rat* written *RA*, *RAE*, *RAS* or *RAT*);
- The word *lapin* and the six words proposed in Grade 2 do not contain a morphogram; the last level corresponded to their correct spelling.

For the words *rat* and *éléphant*, which contain a final morphogram, the last level of the coding of phonographic and phonogrammic performance doesn't correspond to the correct spelling.

2.4.3. Rating of Morphogrammic Performance

We coded the lexical morphogrammic performance for the two target words pupils wrote at the beginning and end of Grade 1 (*rat*, *éléphant*), the grammatical morphogrammic performance (use of nominal and verbal plural markers) for three words in the two sentences (*jouE*, *lapinS*, *courENT*) at the end of Grade 1, and for two words in one sentence (*saladeS, poussENT*) at the end of Grade 2 according to three levels:

1. No morphogrammic marker (for example*: ra**t*** written *ra*; *éléphan**t*** written *éléphan*); or morphogram not plausible, for example: *ra**t*** written *ra**i***; *éléphan**t*** written *éléphan**h*** (= 0 point).

[3]These written productions are called Legal spelling, in reference to the work of Treiman (1993: 49).

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2. Presence of one (or even two) plausible morphogram(s) processing of the phonographic aspects of the word corresponded to Levels 3 or 4 of the phonogrammic coding scheme, for example: *ra**t*** written *ra**d***, *ra**x*** or *ra**s***; *éléphan**t*** written *éléfen**s*** or *éléfan**d***, *jou**e*** written *jou**t*** (= 1 point).

3. Presence of the expected morphogram; processing of the phonographic aspects of the word corresponded to Levels 3 or 4 of the phonogrammic coding scheme (= 2 points).

3. Results

3.1. Orthographic Performance

At the beginning of Grade 1 in September, pupils' orthographic performance was weak: 1.5% of intended spellings for *rat* (N = 10), 0% for *éléphant,* and 3.8% for *lapin* (N = 26). The sentence *Tom joue avec le rat* was never spelled correctly. Eight months later, at the end of Grade 1, the orthographic performance was 30.8% for *rat* (N = 208), 13.8% for *éléphant* (N = 93), and 77.1% for *lapin* (N = 521). With regard to sentence writing, at the end of Grade 1, pupils' performance for the sentence *Tom joue avec le rat* was 6.8% (N = 46), and *Les lapins courent vite* was never spelled correctly.

At the end of Grade 2, orthographic performance was 75.4% for *patin* (N = 510), 29.3% for *pâtisson* (N = 198), 79% for *capuchon* (N = 534), 55.6% for *récréation* (N = 376), 79.1% for *charitable* (N = 535), and 21.4% for *magnifique* (N = 145). With regard to sentence writing, *En été, les salades vertes poussent dans les jardins.* was spelled correctly 17 times (2.5%) and *Les jeunes canetons picorent le blé avec la poule noire.* was spelled correctly five times (0.7%); only four pupils wrote both sentences in the standardized way (0.6%).

In terms of orthographic performance, some items are correctly spelled, such as *lapin* at the end of Grade 1 or *patin*, *charitable*, and *capuchon* in Grade 2, while others are more problematic. We therefore decided to conduct an analysis which involved successively considering different aspects of French spelling: phonographic correspondences, phonogrammic understanding, the presence of derivative letters (lexical morphograms), and knowledge of inflectional morphology (grammatical morphograms).

3.2. Phonographic and Phonogrammic Performance

3.2.1. Overall development from the beginning of Grade 1 to the end of Grade 2

There is a highly significant association between grade level and response type ($\chi^2(6, N = 8112$[4]$) = 4594.79; p < .01; V = 0.52$). An absence of response or drawing was rare and diminished with repeated testing and moving from Grade 1 to 2 (7.3% at the beginning of Grade 1, see Figure 1; 0.3% of responses at the end of Grade 1 and 0.3% at the end of Grade 2).

At the beginning of Grade 1, more than one-third of the responses (37.4%) were written markings that did not correspond at all with the spoken word (for instance

[4]Pupils wrote 3 words at the beginning and the end of Grade 1 and 6 words at the end of Grade 2 (N = 676x3 + 676x3 + 676x6).

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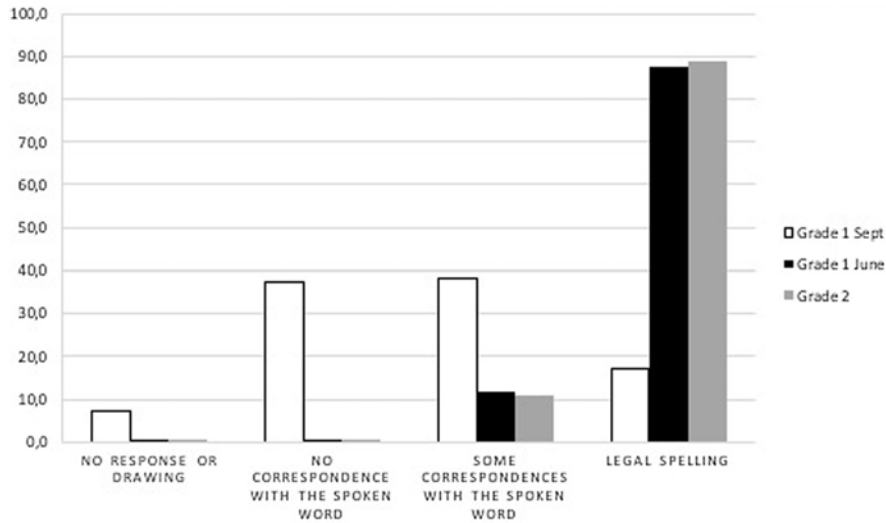

Figure 1. Distribution of the percentages for the different types of responses to the dictated single words.

PKW for *rat*). Similar to the lack of response or drawing, this type of response had virtually disappeared by the end of Grade 1 (0.4% of responses at the end of Grade 1 and 0.02% by the end of Grade 2). Thus, during Grade 1, all pupils learned to understand the alphabetic principle and began using phonographic equivalents to encode words. This encoding was still partial and approximate for more than one-third of the words produced by the pupils at the beginning of Grade 1 (38.2% of responses). By the end of Grade 1, however, encoding was largely complete (87.5% of the responses were consistent with the spoken word by the end of Grade 1, and 88.8% by the end of Grade 2). It therefore seems that pupils learn to understand how to encode a word mainly during Grade 1. In other words, they learn that a word has to be completely broken down into phonemes which they then link to the corresponding graphemes to encode it.

In addition to the increase in legal spellings, there is also a change in the distribution of phonographic (the chosen graphemes correctly code the corresponding phonemes, but not all expected graphemes are included, and the rules governing intralexical positions are not necessarily respected) and phonogrammic legal spellings (all graphemes are expected, see Table 2). At the beginning of Grade 1, the majority of legal spellings are phonographic (23.7% vs. 1.9% of phonogrammic spellings). At the end of Grade 1, the two types of spellings are equivalent (43.9% and 40.1%). Finally, at the end of Grade 2, the majority of legal spellings are phonogrammic (56.7% vs. 32.1% of phonographic). It appears that, by the end of the first year of elementary school, pupils know that all phonemes must be coded (84% of legal spellings), and they begin to use spelling patterns. We also note that the process initiated is relatively slow, since phonogrammic spellings increase slightly between the end of Grade 1 to Grade 2 (from 40% to 56.7%). However, we cannot draw a definitive conclusion because different oral material was used at the measurement points (see 3.2.2).

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Table 2. Distribution (in numbers and percentages) of the two types of legal spellings

	Grade 1 September		Grade 1 June		Grade 2	
	N	%	N	%	N	%
Phonographic legal spellings	321	23,7	594	43.9	1304	32.1
Phonogrammic legal spellings	26	1.9	542	40.1	2298	56.7
Total legal spelling	347	25.7*	1136	84*	3602	88.8
Test	$\chi^2(2, N = 5085^1) = 452.48$; $p < .01$; V = 0,298					

*The percentage is different from that in the figure 1 because the word *rat* is not taken into account.
[1]As production of the word rat is necessarily phonogrammic when it corresponds with the spoken word, we did not include it in the analysis. Then, N = 676x3 + 676x3 + 676x6.

Table 3. Distribution (in numbers and percentages) for the different types of responses to the dictated single words at the beginning of Grade 1

	rat		lapin		éléphant	
	N	%	N	%	N	%
No response or drawings	38	5.6	44	6.5	66	9.8
No correspondence with the spoken word	100	14.8	242	35.7	417	61.7
Some correspondences with the spoken word	288	42.6	324	47.9	163	24.1
Legal spellings	250	37	67	9.9	30	4.4
Test	$\chi^2(6, N = 2028) = 504.14$; $p < .01$; V = 0.35					

3.2.2. Consideration of how the oral material influences the development

In French, some phonemes are coded by single-letter graphemes and others by several-letter graphemes (simple vs. complex graphemes); some phonemes can only be transcribed in one possible way, whereas others can be transcribed in several ways (consistent vs. inconsistent phonographic relationship). Furthermore, the phonemic value of a grapheme can change depending on its intralexical context (non-contextual vs. contextual grapheme)[5].

Words dictated at the beginning of Grade 1. At the beginning of Grade 1 (see Table 3), the linguistic difficulty led to a higher number of missing answers (or drawings). The longest and more complex word (*éléphant*) lead to higher number of that kind of answers: 9.8% vs. 5.6% for *rat* and 6.5% for *lapin*. Besides, the more linguistically complex the word is, the greater the number of productions that do not correspond to the spoken word are: the word *éléphant* leads to more inaccurate spellings (61.7%) than the word *lapin* (35.7%,), which itself is more often transcribed without correspondence with the spoken word than the word *rat* (14.8%). For the written productions taking into account the spoken word (i.e. some phoneme-grapheme

[5]This aspect was not taken into account in the analysis of the responses conforming with the spoken form of the word when each of the phonemes was coded by a plausible grapheme (= phonographic production).

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Table 4. Distribution (in numbers and percentages) for the different types of responses to the dictated single words at the end of Grade 1

	rat		lapin		éléphant	
	N	%	N	%	N	%
No response or drawings	2	0.3	0	0	5	0.7
No correspondence with the spoken word	2	0.3	3	0.4	3	0.4
Some correspondences with the spoken word	34	5	53	7.8	152	22.5
Legal spellings	638	94.4	620	91.7	516	76.3
Test	$\chi^2(6, N = 2028) = 121.14; p < .01; V = 0.17$					

correspondences contained in the written segment) and for legal spellings, we observed a variation inversely proportional to the results presented above: 79.6% of responses of these two types for *rat* (42.6% of some correspondences and 37% of legal spellings), 57.8% for *lapin* (47.9 and 9.9%), and 28.5% for *éléphant* (24.1% and 4.4%). The distinction between these two types of production revealed differences depending on the word dictated. Thus, in 37% of the cases, pupils encoding the word *rat* produced a legal spelling, whereas for the words *lapin,* this percentage was only 9.9% and 4.4% for *éléphant*.

Comparing legal spellings according to their phonographic or phonogrammic[6] characteristics at the beginning of Grade 1, we observed that the word *lapin* was coded in the standardized manner in 26 of the 67 cases observed (38.8%), whereas the word *éléphant* was never coded in the phonogrammic manner. This difference[7] is significant ($\chi^2(1, N = 97) = 16.03; p < .01; V = 0.41$) and can be explained by the linguistic characteristics of the words the pupils had to encode. Indeed, three of the four graphemes necessary to spell the word *lapin* are simple and consistent while only one of five graphemes in *éléphant* is simple and consistent.

Words dictated at the end of Grade 1. At the end of Grade 1 (see Table 4), by which time only very few pupils did not provide responses/drawings (0.3% for *rat*, 0% for *lapin*, and 0.7% for *éléphant*), it was no longer possible to evaluate the effect of linguistic difficulty. Equivalent results are observed for the answers that did not correspond with the spoken word: 0.3% for *rat*, 0.4% for *lapin*, and 0.4% for *éléphant*.

Consequently, almost all productions involve oral processing (some phoneme-grapheme correspondences, phonographic or phonogrammic legal spellings) and, therefore, there was no difference between the three words: 99.4% of legal spelling for *rat* (5% of some correspondences and 94.4% of legal spellings), 99.5% for *lapin* (7.8% and 91.7%), and 98.8% for *éléphant* (22.5% and 76.3%). A very large majority of these productions were phonographic or phonogrammic legal spellings (94.4% for *rat*, 91.7% for *lapin,* and 76.3% for *éléphant*). Nevertheless, pupils' performance was weaker for the word *éléphant*.

[6]For the words *lapin* and *éléphant,* but excluding the word *rat* (see table 2).

[7]A test of independence was conducted to evaluate the association between word categories ("Elephant" and "Rabbit") and types of responses (phonographic and phonogrammic).

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Table 5. Distribution of percentages for different types of responses related to the spoken word for single words dictated in Grade 2

	patin		pâtisson		charita-ble		magnifi-que		récréati-on		capuchon	
	N	%	N	%	N	%	N	%	N	%	N	%
Some correspondences	44	6.5	65	9.6	113	16.8	45	6.7	117	17.3	57	8.4
Phonographic legal spellings	121	17.9	412	61	24	3.6	481	71.7	182	27	84	12.4
Phonogrammic legal spellings	510	75.6	198	29.3	535	79.6	145	21.6	376	55.7	534	*79.1*
	$\chi^2(10, N = 4043) = 13.53; p < .01; V = 0.408$											

The comparison of the distribution of phonographic and phonogrammic spellings between the beginning and end of Grade 1 shows a change, but retains the differences observed at the beginning of the year between the two items: 84% of phonogrammic legal spellings for *lapin* compared to 4.1% for the word *éléphant* ($\chi^2(1, N = 1136) = 720.55; p < .01; V = 0.8$).

Words dictated in Grade 2. As mentioned in the first part of the analysis, by the end of Grade 2, the cases where pupils provided no responses/drawings or productions unrelated to the spoken word were negligible (0.27% and 0.03%; see 3.2.1). We will therefore only discuss the answers produced that were related to the spoken word here.

For productions that partially corresponded with the spoken word (cf. Table 5, Line 1), there were two possible scenarios: either the pupil did not code all the phonemes, or he or she coded them incorrectly. Such partially correct responses seem to be mainly influenced by the length of the word: 6.5% for *patin* (four phonemes), 8.4% for *capuchon* (six phonemes), 9.6% for *pâtisson* (six phonemes), 16.8% for *charitable* (eight phonemes) and 17.3% for *récréation* (nine phonemes). The word *magnifique* (seven phonemes) was the only exception that did not follow this pattern (only 6.7% of partially correct productions). A possible explanation is that another factor comes into play – frequency; indeed, *magnifique* is the only word included in the lexicographical reference bank for Cycle 2[8] drawn up by Brunet (2010). Another possible explanation is linked to the higher proportion of phonographic responses for this word (71.7%; cf. Table 5, Line 2), most of which come from an incorrect but acceptable pronunciation of the word ([manifik] instead of [maɲifik] – with [ɲ] coded by the single letter N instead of the grapheme GN, e.g. *manifique*, considered as a phonographic legal spelling).

For legal spellings, we observed a very high percentage of such responses, showing that exhaustive oral encoding is no longer such a problem for second-graders[9] (see Table 5, sum of Line 2 and 3): *patin* (93.5%), *pâtisson* (90.4%), *charitable* (83.2%), *magnifique* (93.3%), *récréation* (82.7%), and *capuchon* (91.6%). In Grade 2, pupils have learned sufficient phoneme-grapheme correspondences to

[8]In France, Cycle 2 includes the first, second and third grades of elementary school.
[9]ibid.

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encode the words. Thus, the simple or complex nature of a grapheme is no longer a determining factor that explains differences in pupils' performance.

However, if we consider the phonogrammic legal spellings[10] (see Table 5, Line 3), it appears that the consistency and contextuality of the graphemes composing the items had an effect on the quality of responses.

A first group of three words (*patin, charitable, capuchon*) was thus written in the standardized way in more than 75% of the cases. In each of these three words, all graphemes are consistent except for one, the *-in* in *patin*, the *e* in *charitable*, and the first *-c* in *capuchon*; these last two graphemes are also the only contextual graphemes. Nevertheless, from the point of view of consistency, these phonograms are most frequently used to code the corresponding phoneme (Catach, 1995). Moreover, due to their position (end of word for *-e*, beginning of word for *-c*), their contextual character is not problematic; no sound for the grapheme *-e* in 99.7% of cases, and the sound /k/ is written with the letter *-c* in 95.6% of cases (New et al., 2004).

The word *récréation* was written phonogrammically by 55.7% of the pupils and was the most challenging in terms of its consistency and contextuality (it contains five inconsistent graphemes, three of which are also contextual). However, this word is also the most familiar of the proposed set.[11] This latter property may have resulted in the relative success of the pupils in our sample.

The last two words, *pâtisson* and *magnifique*, were written phonogrammically least often (only 29.3% and 21.6% of pupils succeeded in doing so, respectively), but for different reasons. The word *pâtisson* contains a grapheme which is both inconsistent and contextual (*-ss*).[12] Together with the grapheme *-s, -ss* accounts for the majority of possible transcriptions of the phoneme /s/ (69% of occurrences compared to 26% for *-c* or *-ç* and 3.3% for *t(+i)*, Catach 1995). This probably explains why 49.6% of pupils encoded the phoneme with the letter *-s* alone (while only 1.4% used the grapheme *-c* and wrote *paticon*), which is the most frequent transcription of the phoneme /s/ (61.7% compared to 21% for *-ss*; New et al. 2004). These results are in line with those of Mousty et Allegria (1999): when several graphemes are available for a phoneme, young pupils select one in preference to the other, regardless of the context. Moreover, the word refers to an ancient and forgotten vegetable, a variety of summer squash, which most second-graders probably do not know. It is therefore both unfamiliar and infrequent in the French language.

Finally, we examined pupils' productions of the word *magnifique* (written phonogrammically by only 21.6% of them) and found that 64.4% of the children used the letter N to transcribe the phoneme /ɲ/. We do not know whether this phoneme was pronounced during the dictation. Indeed, the phonology of the standard pronunciation of the word /maɲifik/ and that of the more widespread pronunciation common in everyday language /manifik/ are very similar (the

[10]And therefore spelling of these six words which do not contain a morphogram.

[11]*Récréation* is the French word for recess and, therefore, part of everyday school vocabulary; in addition, it might also have emotional value for children.

[12]The circumflex accent is not taken into account, as it does not transform the pronunciation of the word. This is an old ethymological mark, uncommon in the French written language (1% of transcriptions of the [a] sound, Catach, 1995).

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Table 6. Distribution of percentages of types of morphogrammic lexical responses

N = 676	No marker	Use of plausible marker at the end of the word			Correct marker
		-d	-e (-es)	-S (+1x)	**-T (-ts)**
rat September Grade 1	95	0.1	3	0.3	**1.6**
rat June Grade 1	43	1	8	17.2	**30.8**
éléphant September Grade 1	96.3		2.2	1.2	**0.3**
éléphant June Grade 1	67	0.1	5.5	3.7	**23.7**

phonemes /ɲ/ and /n/ are very close;[13] the difference in pronunciation is barely perceptible). Thus, the pupils possibly accurately encoded what they heard, unless the word was already part of their personal lexical repertoire, in which case they would have directly written it with the correct spelling. In addition to this hypotheses, the identity of the phoneme /ɲ/ is subject to controversy, with some linguists assimilating it with the phonemes /nj/ (Martinet & Walter 1973) which are transcribed as *ni* in some words of the French language (for example *panier*, 'basket').

3.3. Lexical Morphogrammic Performance in Grade 1

Two words allow us to analyze the lexical morphogrammic performance of pupils: *rat* and *éléphant*. They both end with a derivative letter which can serve to link the word to its family (*raton*, *éléphanteau*). Table 6 shows the graphological choices that pupils made at the beginning of Grade 1 to represent the end of these two words.

In September of Grade 1, most pupils neglected to use a morphogrammic marker (or derivative letter): 95% for *rat* (N = 642), 96.3% for *éléphant* (N = 651). The use of the correct marker was minimal at the beginning of the school year: *rat* was written with the correct marker by 1.6% of pupils (N = 11), *éléphant* by 0.3% (N = 2).

By the end of the school year, the pupils' productions had visibly improved. More than half of the pupils wrote *rat* with a final letter, either with the expected *-t* (30.8%) or a frequent (and therefore plausible) letter at the end of the noun (*-s* for 17.2% of the pupils; *-e* (or *-es*) for 8%). A very small number of pupils used the spelling *rad* (1%, seven pupils). Thus, of the 57% of pupils who used a final morphogram, just over half used the expected morphogram *-t*. These results are in line with the results by Sénéchal and colleagues. The expected final letter is very rare in Grade 1 and much more so in Grade 2. This letter is sometimes replaced by a plausible marker at the end of the word.

[13]These two phonemes are occlusive nasal, dental for /n/, mid-palatal for /ɲ/.

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Table 7. Distribution of percentages of types of morphological responses regarding the plural noun marker

N=676	No plural marker	Use of plausible marker at the end of the word *-ent*	**Expected marker** ***-s***
lapins June Grade 1	84.8	–	**15.2**
salades June Grade 2	56.7	0.3	**43**

To write *éléphant*, only one-third of the pupils added a final morphogram in June; among these pupils, more than two-thirds chose the expected morphogram *-t*. However, this amounted to fewer pupils than for *rat*: 160 pupils for *éléphant* and 208 for *rat*.

If we analyze the incorrect morphograms added to the end of the words, a significant number of pupils also opted for a plausible morphogram for the end of the noun *éléphant*: *e* (even if standardized reading would not allow *éléphane* to be read as /elefã/[14]) or *-s,* which represented 60 of the 63 incorrect morphograms used. This constituted 60/223 = 27% of the plausible letters chosen for the end of the word *(-t, -s, -e)*.

There was therefore a significant increase in the number of pupils who selected and added a morphogram, which was either plausible, standardized, or not, to the end of the words at the end of Grade 1. It seems as if the idea of using an additional letter at the end of the word gains momentum – a development towards pupils approximately applying morphological rules to their writing.

To conclude, from the entire sample, 11 pupils wrote *rat* in September. By the end of the year, nine of these pupils still wrote *rat*; one wrote *ras*, and one wrote *raes*. In all cases, the pupils had the idea of using an additional letter, but their performance was perhaps disturbed by them starting to learn grammatical morphograms.

It is therefore important to analyze how the use of grammatical morphology evolves, which is possible with the data from this study because we have follow-up assessments for pupils up to the end of Grade 2.

3.4. Grammatical morphogrammic performance in Grades 1 and 2

Based on the data, we analyzed the presence of morphological markers used for the plural nouns and verbs at the end of Grades 1 and 2. Once again, this involved investigating how the pupils' choices developed over the period and examining the plausibility of the morphograms added by the pupils.

[14]*Petit Robert* 2011: 11,453 feminine nouns end in *e*, and 6544 masculine nouns end in e. Epicene nouns, which have identical masculine and feminine forms, such as *artiste* 'artist', should be added to this. The final *e* is frequently used at the end of French nouns; it either does not affect the chain of sounds, as in *poule,* 'hen' (if it were omitted, the word would be pronounced in the same way) or it allows for the consonant that precedes it to be enunciated, as in *rate,* 'miss', or *petite,* 'small'.

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Table 8. Distribution of percentages of types of morphogrammic responses regarding the plural verb marker

N = 676	No plural marker	Use of plausible marker at the end of the word		Expected marker
		-es	-s	**-ent**
courent June Grade 1	629 (of which 6 *court*) 93%	1	5.8	**0.1**
poussent June Grade 2	597 pousse, pous 88,3%	4.4	–	**7.2**

Marking of the plural noun. With regard to the marking of the plural noun (see Table 4), we used the pupils' written productions for the nouns *lapins* (in the sentence *Les lapins courent vite.,* at the end of Grade 1) and *salades* (in the sentence *Les salades vertes poussent dans le jardin.,* at the end of Grade 2). In both sentences, which pupils produced in response to a dictation, the noun under analysis is situated at the beginning of the sentence, directly after the determiner *les*; we therefore considered the writing of these two nouns to be comparable.

We observed a strong increase in the use of the expected *s* marker within one year: from 103 pupils to 291 pupils out of the 676 in the sample; that is, an increase from 15% to 43% of the pupils' written productions included the expected *s* marker. Nevertheless, a large majority of the pupils neglected to use the plural marker: 84.8% at the end of Grade 1 and still 56.7% at the end of Grade 2. In other words, five out of six pupils at the end of Grade 1 and just over half of the pupils at the end of Grade 2 omitted the *-s* on the plural noun. The use of other markers was negligible: the verbal plural marker for the noun *salades* (0.3%), no use of *-x* or any other final letter.

Marking of the plural verb. To determine performance regarding verb agreement (see Table 8), we examined writing of the verbs *courent* (*Les lapins courent vite.*) and *poussent* (*Les salades vertes poussent dans le jardin.*); these are two comparable verbs as they each feature a silent plural marker and are located in a regular position in the sentence (just after the subject).

The percentage of written productions with the expected marker *-nt* were low: 0.1% in Grade 1 for *courent* and 7% in Grade 2 for *poussent*. If we add the productions comprising the nominal *s* marker to those with standardized markers, the percentages with markers were 6.9% for *courent* (*cours* or *course*) and 11.6% for *poussent* (*pousses*). Thus, in most of the cases, the words were written without any plural marker (93% for *courent* and 88.3% for *poussent*).

When the sentence is treated as a chain of words that have to agree, the plural morphogram is triggered depending on the marker added to the noun, which is the subject. At the end of Grade 2, of the 79 pupils who used a plural marker on the verb (*-s* or *-ent*), 65 (82.3%) also put *salades* in the plural. Conversely, of the 293 pupils who wrote *salades* in the plural form, 65 (22.2%) put a plural marker on the verb.

This analysis therefore shows that, at the end of the Grade 2 of elementary school, if pupils use the plural marker on the root noun, it does not guarantee they will use

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the plural verb. Just because a pupil is capable of using the plural noun does not mean that he or she is also capable of using the plural verb. On the other hand, most pupils who wrote the verb in the plural form also wrote the root noun of the sentence's subject in the plural form. These are the pupils who are beginning to master how to completely apply the subject-verb agreement chain.

4. Discussion and Perspectives

This study used the written productions of 676 elementary-school pupils at the beginning and end of Grade 1, and at the end of Grade 2. The available data allowed us to analyze pupils' graphological markings with regard to the phonogrammic and (derivational and grammatical) morphogrammic properties of the French language at the beginning of the teaching and learning of the written language. Our study focused on pupils' lexical and grammatical spelling skills in early elementary school and their development. Based on the literature and the specific features of the French writing system, we hypothesized that both skill types would develop as early as Grade 1 of elementary school, with lexical spelling skills developing more rapidly.

The analysis of our body of evidence enables us to show that, by the end of Grade 1 of elementary school, the pupils know that all phonemes must be coded, and they start using spelling patterns, which is a step forward in documenting the development of phonological skills. More precisely, as regards the development of the ability to transcribe the sound chain, we distinguished: 1/ phonographic legal spellings (all the phonemes of the word were coded using a plausible phonogram, including cases of over-segmentation; the rules of position governing the graphemes in the word were not taken into account); 2/ phonogrammic legal spellings (all the phonemes were coded with the intended phonogram). In this way, we were able to qualitatively describe the changes between the beginning and end of the year in Grade 1, and the changes between the end of Grade 1 and the end of Grade 2. We found that almost all productions involve oral processing at the end of Grade 1 (some phoneme-grapheme correspondences, phonographic or phonogrammic legal spellings). At the beginning of Grade 1, the majority of legal spellings are phonographic (23.7% vs. 1.9% of phonogrammic spellings). At the end of Grade 1, the two types of spellings are equivalent (43.9% and 40.1%). Then phonogrammic spellings increase slightly between the end of Grade 1 to Grade 2 (from 40.1% to 56.7%), which leaves room for improvement. These results complement those of Joye et al. (2022) who noted the relatively high frequency of phoneme substitutions, phoneme omissions, additions or inversions and errors with complex and contextual graphemes in Grades 1 and 2 but did not find any significative evolution in the proportion of phonological errors between Grade 1 and Grade 2. They are compatible with those of Ardanouy et al. (2024) who found that phonological skills were dominant in the early grades. Nevertheless, this conclusion is limited by the fact that the oral material used at the two annual data collection points in our study was not identical. Pupils' processing is essentially phonographic. At the end of the second year, the simple or complex nature of a grapheme is no longer a determining factor that explains differences in pupils' performance. On the other hand, it appears that the consistency and contextuality of the graphemes composing the word to be written, as well as the frequency of the word, affect pupils'

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development from phonographic processing towards phonogrammic processing considerably, regardless of whether it is standardized or not. These two points might explain the many variations in spelling obtained, depending on whether pupils only encode what they hear (with increasing accuracy) or if the word is part of pupils' personal lexical repertoire, in which case they can directly write it orthographically correctly, or partially correctly.

It should be noted that, although morphographic markers were almost completely absent at the beginning of Grade 1, they increase by the end of Grade 1 and Grade 2, with pupils initially concentrating on plausible letters without being able to discriminate between lexical and grammatical aspects. Pupils appear to develop a first "morphological awareness", without being able to distinguish between lexical and grammatical morphograms. We can thus hypothesize that, if pupils have the idea of using additional letters, they may be confused by the early teaching of grammatical morphograms. In other words, grammatical morphogrammic plausibility might be built on incomplete orthographic skills (phonogrammy and lexical morphogrammy) that are in the process of developing. Shrager and Siegler's "overlapping waves" model (1998) makes it possible to conceptualize this aspect. Aware of the need to add final letters, pupils have several lexical or grammatical strategies that are available for adding them and that are activated according to variables that have yet to be defined, but are possibly the consistency and contextuality of graphemes, word frequency, and syntactic context; anticipating profiles of spellers observed later (students of Grades 3 and 5; Morin et al., 2018). Among these strategies, some others may be erroneous, linked to what is taught in the classroom, leading for example to the over-use of a specific letter).

Our study also documents what constitutes a real challenge for students, namely the production of plural marks of nouns and verbs. This point was not treated by Joye et al. (2022) and treated altogether in the study by Morin et al. (2018). With regard to plural markers, we observed a strong increase in the use of the expected *s* plural marker within one year (from 15% to 43% of the pupils' written productions included this expected *s* marker). We found that the use of a plural marker attached to the subject's root noun by pupils at the end of Grade 2 of elementary school (which was not yet the case for the majority of pupils) does not guarantee that they add a plural marker to the verb (added by a small fraction of pupils, around 7%). On the other hand, most pupils who wrote the verb in the plural form also wrote the root noun of the sentence's subject in the plural form. This result was observed for items that were simple, in regular sentences. They are in line with the study by Thévenin et al. (1999), the most recurrent errors in Grades 1 to 3 concern the marking of verbs. They are in line with studies that highlight the emergence of morphological skills throughout primary school (Morin et al. 2018; Joye et al. 2022; Ardanouy et al., 2024). Above all, they indicate that marking the root noun's plural is a prerequisite to the verbal pluralization, the two sub-skills progressing with a time-lag. This point is important to help teachers defining relevant objectives within a teaching progression.

Our study has some limitations that need to be highlighted. The first one concerns the number of words written by the pupils in Grade 1 (3 isolated words and 5 other words constituting a sentence at the beginning and end of Grade 1, with an additional sentence at the end of Grade 1 designed to test skills in inflectional

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morphology). The second concerns the choice of different tests at the end of Grade 1 and Grade 2. This question of the choice of items still arises, in relation to the age of the pupils (Ardanouy et al., 2024). The third limitation lies in the fact that we did not compare pupils' performance on the dictation task and the text production task: the differences between the results on the two tasks, particularly with regard to morphological skills (Joye et al., 2022) invite researchers to pay close attention to the choice of items and tasks in order to propose different tasks to students, notably the tasks that require grammatical spelling, as Morin et al. (2018) did.

Based on these results and previous studies, we need to consider the importance of developing a precise and progressive test that will allow us to position the pupils over the first two years of elementary school with regard to the development of their phonogrammic, lexical morphogrammic, and grammatical skills, taking into account the different variables: consistency, frequency, syntactic context within which words are used, words that do not feature different morphograms (for example, the writing of the verb *courent* could be replaced by the adjective *court*, 'short', the noun *cours*, 'courtyard': other inflections that comprise plausible morphograms and can interfere with metalinguistic reflection). We certainly need a test with more words as three words is pretty simplistic to assess such a development. The *Francographe* test (Rodi et al., 2018), currently used with older pupils (Grades 2 to 5), may be an entry to think and develop a test to target more specifically Grades 1 and 2 within this frame. Taking account of texts written by pupils, as Joye et al. (2022) have done, is another interesting approach, which can help to clarify the development of skills when pupils choose words and syntactic structures (see Ponton et al., 2021 for word segmentation in Grade 1), if there is the intermediate assessment with dictation of sentences to complete the overview.

This study also raises the question of possible interferences between the beginning of grammatical teaching and the continuation of lexical spelling teaching, which is not completed by the end of Grade 2. Minimizing interferences and confusions is a didactic challenge posed by the Grade 2 class and may appear to be significant in terms of the development of the spelling competence. While pupils are capable of making progress in marking nominal number, it appears that marking verbal number is more complex, as Thévenin et al. (1999) have pointed out. There is certainly a need to reflect on the teaching of these two points, which are central to the French writing system and valued by society. For example, shouldn't we stop using the *plural* term for the verb mark and opt for the *person* mark? The terms *plural mark* would be reserved for nominal number marks and *person mark* for verbs. There is also a need for a reflection in the current context of linguistic and cultural diversity in ordinary classes about a progression starting before Grades 1 and 2 and a massive work to give to the pupils a good phonological awareness in French if it is the language of instruction. This would support the learning of writing to come. This work on phonological awareness should be pursued in Grades 1 and 2 to guarantee that words are correctly heard and pronounced. These recommendations presuppose a culture of languages: teachers need to learn more about the writing system they teach during their training (Treiman & Kessler, 2022).

As recommended by Ardanouy et al. (2024), and already observed in French classes (Gourdet et al., 2015; Riou & Brissaud, 2021), the teaching of morphological

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skills is possible and desirable from the first year of primary schooling to support pupils in their learning of derivational morphology which they are learning implicitly (see the avenues opened up by Pacton et al., 2005; Gingras & Sénéchal, 2019; Pacton & Peereman, 2023) and support them in their forthcoming learning of inflectional morphology. Grades 1 and 2 are just the beginning of a learning that promises to be long and our results tend to show the risk of teaching morphological spelling on a weak phonological spelling skill. Then teachers really need support with linguistic benchmarks (Morin et al., 2018) and teaching tools.

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