The development of spelling and orthographic knowledge in English as an L2: A longitudinal case study

Hossein Nassaji
University of Victoria

This longitudinal case study investigated the development of spelling and orthographic knowledge in a child ESL learner from Grade 1 through Grade 4. Misspelling data from the learner's free writings were examined for overall patterns of spelling development and the word-specific changes in the spelling of individual words. The aim was to track the developmental changes taking place in his spelling behaviour and also examine whether any stage-like pattern of development could be identified in his spelling performance. Analysis of data showed that although the child's overall developmental path was progressive in that he produced increasingly more complex orthographic spellings over time, there was a high degree of variability in the learner's misspelling behaviour. Thus, overall, the spelling performance of this ESL learner can be best explained by a spelling model that views the path of spelling development as strategic, overlapping and wave-like rather than truly stage-like.

Cette étude de cas longitudinale examine le développement des connaissances en orthographe chez un enfant apprenant d'anglais langue seconde, de la 1ère à la 4ème année. On a étudié les fautes d'orthographe dans les productions écrites libres de l'apprenant pour y rechercher des patrons globaux de développement de l'orthographe et des changements spécifiques dans l'orthographe des mots isolés. Le but était d'analyser les changements développementaux dans le comportement orthographique et de vérifier la présence de stades. L'analyse des données a démontré que bien que la trajectoire du développement de l'enfant soit progressive, au sens où avec le temps, sa production orthographique est de plus en plus complexe, il existe une grande variabilité dans les fautes d'orthographe de l'apprenant. Par conséquent, dans l'ensemble, un modèle qui considère le cheminement de l'orthographe comme stratégique et progressant par des chevauchements et des vagues plutôt que par de véritables stades est celui qui rendrait le mieux compte de la performance en orthographe de cet apprenant d'anglais langue seconde.

Address for correspondence: Hossein Nassaji, Department of Linguistics, University of Victoria, P.O. Box 3045, Stn. CSC, Victoria, BC, Canada V8W 3P4
E-mail: nassaji@uvic.ca.

Introduction

Learning how to spell words accurately is a complex developmental skill. Therefore, in recent years an increasing number of L1-based studies have investigated learners' spelling ability and how this skill develops over time (e.g., Ehri, 1980, 1987, 1989, 1992, 2000; Waters, Bruck, and Seidenberg, 1985; Goswami, 1988, 1992; Bruck and Treiman, 1990; Bruck and Waters, 1990; Goswami and Bryant, 1990; Treiman, 1991, 1993; Treiman, Zukowski, and Richmond-Welty, 1995; Reece and Treiman, 2001; Greenberg, Ehri, and Perin, 2002). In particular, a growing body of L1 research has examined the developmental sequences in spelling and how children progress from a no knowledge stage to an increasingly more sophisticated spelling ability. The development of spelling knowledge is also an important aspect of L2 literacy acquisition. Therefore, it is important to understand how L2 learners develop their spelling ability. Longitudinal studies that trace the development of spelling knowledge provide important insights into how learners develop their spelling skills over time. However, very few such studies have examined these processes in children learning English as an L2. This longitudinal case study investigated the development of spelling ability of a young ESL learner over a four year period from Grade 1 up to Grade 4.

Review of the literature

To understand a learner's spelling development, researchers have examined learners' spellings from different perspectives. One such perspective is the stage-based theories of L2 development (e.g., Henderson, 1985; Ehri, 1989). According to these theories, there is a sequence in the acquisition of spelling knowledge which takes place through a series of developmental stages (Gentry, 1978, 1982; Ehri, 1980, 1989, 1992, 2000; Henderson, 1980, 1985; Frith, 1985; Barnes, 1992; Beers and Beers, 1992; Schlagal, 1992; Nunes, Bryant, and Bindman, 1997; Bear and Templeton, 1998). In this view, in initial stages of spelling development, spellers mainly use their knowledge of phonology to spell words. It is during the later stages of development that they fine tune their spelling knowledge, learn more about the complexities of phonological, orthographic, and morphological characteristics of words, and use these processes when spelling words (Nunes *et al*., 1997; Treiman and Bourassa, 2000). Frith (1985), for example, suggested that learners may begin by reliance on phonological procedures at early stages of reading and spelling and then move towards the use of more orthographically and lexically-oriented procedures as they become mature readers and spellers. Ehri (1989) proposed that learners pass through at least four stages of development before they become skilled spellers: a precommunicative stage (during which words are spelled globally with no reference to sound-letter correspondences), a semiphonetic

stage (during which learners begin to use their knowledge of letter-sound relationships to spell words), a phonetic stage (at which children generate spellings that include all the constituent sounds of the word), and finally a morphemic or transitional stage (during which learners begin to use their morphological knowledge).

Such stage-based accounts of spelling have been shown to provide important insights into how a learner's spelling develops over time. However, some researchers have criticized them as being inadequate to depict an accurate picture of spelling development. Treiman and Bourassa (2000), for example, argued that although these models "give a rough overall picture of spelling development ... they do not fully capture the complexities of phonological and morphological representations as they relate to spelling" (p. 2). Varnhagen (1995) suggested that although spelling seems to progress from incomprehensible to comprehensible forms, the movement from one stage to another stage is not invariant. She argued that the sequence of development may differ from word to word. Also, children may seem to possess a wide range of strategies available to them from the very early stages. This latter assumption is different from that of stage-based models that consider that beginning spellers do not have access to complex knowledge sources such as morphological and orthographic knowledge and these skills are developed at advanced stages of spelling development (Treiman and Bourassa, 2000).

Given these observations, some researchers have suggested alternative views of spelling development. One such framework is the overlapping waves model of cognitive development (Siegler, 1996). Siegler suggested that development should be best considered as a variable and multifaceted process and one that involves gradual and continuous changes in frequencies of multiple ways of doing and thinking, rather than a process in which one behaviour in early stages of development is replaced with more sophisticated ones in later stages. Siegler contrasted this view with what he called a staircase view of development, which, according to him, considers development as the "substitution of one mental activity (and accompanying behaviour) for another" (Siegler, 1996, p. 84).

The difference between the stage-based and the overlapping waves theories has been summarized by Kwong and Varnhagen (2005) as follows:

> According to stage accounts, children progress from unsophisticated forms of phonological analysis through more mature phonological and orthographic strategies to retrieval. Progress is sequential, unidirectional, and occurring in a fixed order, and it makes use of children's increasingly mature knowledge of the structure and rules of the sound-spelling system. Overlapping waves theories, on the other hand, predict that strategy development is not so regular and sequential. Children may oscillate among more and less sophisticated strategies. (p. 149)

There are a number of studies in different areas of cognitive psychology that provide support for the overlapping waves models (see Siegler, 1996, for a review). In the area of spelling, Siegler, for example, reported a study in which he asked a group of second graders to spell a number of words that represented a wide variety of sound-letter correspondences. Siegler noted that the children used a variety of strategies to spell the words including sounding out, retrieval, writing alternative spellings, and also looking up the words in the dictionary. There are also other studies that have provided support for the idea that children have access to and use multiple strategies when spelling words (e.g., Varnhagen, 1995; Varnhagen *et al*., 1997; Rittle-Johnson and Siegler, 1999; Kwong and Varnhagen, 2005). Varnhagen (1995), for instance, reported a study in which she investigated both the developmental and individual differences in spelling strategies used by children across Grade 2. Analyzing the learners' errors made on a dictated spelling test, the researcher found that although the children tended to rely on phonetic strategies, they also made increasing use of other strategies such as orthographic strategies when spelling the words. Based on the analysis of the learners' misspellings, Varnhagen (1995) identified a number of strategies including phonological, orthographic, morphemic and mnemonic strategies.

What makes the spelling development complex is that English has an orthographic system with a complex relationship between graphemes and phonemes. In English, not only can one phoneme be represented by different letters or a combination of letters, there are also cases where certain phonemes are pronounced differently or not pronounced at all, depending on where they are in the word. For instance, the letter *l* sounds differently in initial and final positions (such as in *letter* vs. *middle*), or it is not pronounced before *k* in certain words such as in *walk*, *talk*, etc. Therefore, Venezky (1999) pointed out that although English phonemes are typically considered alphabetical, upon a close analysis of the English spelling system one can realize that the English spelling system is not purely alphabetical. There are several cases where the English spelling deviates from pure alphabetic rules in which letters signal sounds. Examples are the use of capital letters to indicate sentence position or the use of the apostrophe to show contraction such as in *won't*.

Because of these characteristics of English spelling, researchers have suggested that while letter-sound correspondence rules may play a major role in English spelling, these principles alone are not sufficient to account for the accurate spelling of many words in English. Therefore, when learners reach a certain level of literacy acquisition, spelling may become more strategic and they may use and integrate various knowledge sources and strategies, including phonological, orthographic, and morphological strategies to spell words (Goswami, 1988; Treiman, 1993; Varnhagen, 1995; Varnhagen *et al*., 1997; Rittle-Johnson and Siegler, 1999).

To this end, a number of studies have examined specific patterns of spelling and have provided additional insights into the complexity of spelling development (e.g., Bruck and Treiman, 1990; Bruck and Waters, 1990; Treiman, 1991; Treiman *et al*., 1995; Treiman and Cassar, 1996; van Bon and Uit De Haag, 1997; Willson, Rupley, Rodriguez, and Mergen, 1999; Reece and Treiman, 2001). These studies have suggested that the ways in which children spell words are affected by different linguistic and structural factors (e.g., length of words and word components). They have also shown how children learn word components such as different phonemes that comprise words, the initial and final consonant clusters, and the various morphological endings in words (e.g., Schlagal, 1992; Treiman *et al*., 1995; Treiman and Cassar, 1996; Cassar and Treiman, 1997; van Bon and Uit De Haag, 1997; Reece and Treiman, 2001). For example, in a recent study, Reece and Treiman (2001) examined the development of letter-name vowels and stressed syllabic /*r*/ in the spelling of L1 first graders. Tracing the changes in these children's spelling of these sounds from fall to spring, these researchers found that children moved from spelling based on one letter for each phonological unit such as *sr* for *sir* to spellings involving more orthographically complex patterns such as the inclusion of *i* in the word *sir*.

Some L1-based studies also suggest that spelling development is related not only to the learner's phonological, orthographic and morphological knowledge but also to the learner's overall reading and decoding strategies. Weekes (1994), for example, found that readers who had been characterized as lexical readers were more accurate at spelling words which needed lexical access, such as irregular words, than those which did not require lexical access, such as non-words or words having a regular spelling pattern. In another study with L1 readers, Greenberg *et al*. (2002) found that when encountering difficulties in reading or spelling words, adults, in comparison to children, tended to rely more on orthographic strategies than on phonological strategies. These findings suggest that learners' course of spelling development is also related to, or constrained by, their overall literacy and text processing strategies.

Although the above studies have produced data that may not be fully accountable by stage-based models, there are studies that have shown that spelling development can be characterized in terms of developmental stages. Nunes *et al*. (1997), for example, investigated the development of spelling in words with morphological endings such as *-ed* in past regular verbs. Based on data from L1 children in three grade levels (2, 3, and 4), the researchers identified five developmental stages in the spelling of these words. They found that initially the children used the *-ed* ending unsystematically. Then they produced spellings with the phonetic transcription of the ending (e.g., *kist*, *slept, soft*). In the third stage, children made some use of *-ed* with verbs but made incorrect generalizations to other verbs and non-verbs (e.g., *kissed, sleped, sofed)*. In the

fourth stage, they confined the *-ed* to past verbs but overgeneralized it to other past verbs (e.g., *kissed*, *sleped*, *soft*). In the last stage, they correctly used these morphological endings in all situations with no incorrect overgeneralizations to other words (e.g., *kissed*, *slept*, *soft*).

Schlagal (1992) examined L1 children's spelling development across six grade levels (from Grade 1 to Grade 6) in an elementary school. Analyzing the learners' misspellings on six spelling lists that varied in terms of spelling difficulty, the researcher identified three categories of error features as the learners progressed through grade levels: early features, constant features, and late features. The early features included errors such as those involving the omission of preconsonental nasals (e.g., ju*m*p) or the use of letter names and letter reversal. The constant feature category included errors such as those resulting from a failure to double consonants (e.g., be*tt*ing), mark long vowels (e.g., gat*e*), or r-color vowels (e.g., h*ear*d). The late features included more complex errors such as those including prefixes and affixes (e.g., *pretective* for *protective*). Schlagal found that the appearance and disappearance of these error types varied across different grade levels. For example, while reversal errors accounted for 10% of the errors at level one, they accounted for 3% at level two, and only one error of that type appeared at level three. Errors in the late feature category were observed at the fifth and sixth levels more frequently than were any other errors. The researcher concluded that the findings of this study "lend increased support to the argument that orthographic knowledge unfolds along developmental lines throughout the elementary years" (p. 47).

The present study

As can be seen, L1 research has placed considerable importance on the role of L1 literacy and the development of orthographic and spelling knowledge, and in this context numerous studies have investigated the ways in which children learn how to spell words in English as an L1. A number of studies have also investigated aspects of spelling skills in the L2 (e.g., Geva, Wade-Woolley and Shany, 1993; Holm and Dodd, 1996; Wade-Woolley and Siegel, 1997; Wang and Geva, 2003). Studies have also examined both the nature of and the different variables affecting learners' spelling performance (e.g., Wade-Woolley and Siegel, 1997; Wang and Geva, 2003). However, most of the current studies, particularly those in L2, are cross-sectional rather than longitudinal, or interventional rather than naturalistic, thus providing only indirect evidence for how children's spelling and orthographic knowledge develop over time. The present study was conducted within a longitudinal perspective, examining the spelling development of one ESL child from Grade 1 through Grade 4. The aim was to track the developmental changes taking place in his spelling behaviour over time, and also examine whether any progressive pattern of

development could be identified in his spelling performance, and if so, whether a stage-based model or an alternative framework such as the overlapping waves model can best explain these developmental changes. The assumption was that if the acquisition of spelling could be characterized in terms of developmental stages, this should be reflected in the learner's performance as he moved from Grades 1 to 4.

Method

The learner

The learner was a child who had recently arrived in Canada and was attending a public elementary school. He was six years old at the beginning of the study and had just started to learn English as a second language. The learner was a normal speller, but he did not have any previous instruction in English, so his oral receptive and productive English skills were at the very early stages of development and were just emerging along with other linguistic skills including vocabulary and grammatical knowledge.

The learner was taught by the same teacher in Grades 1 and 2 and by another teacher in Grades 3 and 4. In Grades 1 and 2, the teacher's method of instruction was predominantly whole language with little explicit spelling instruction. In Grades 3 and 4, the child received some spelling instruction mainly in the form of thematic spelling lists, which were reviewed by the teacher every week. The child also received occasional feedback on his spelling errors in other language arts assignments.

In Grades 1 and 2, the learner, along with other students in class, wrote daily dialogue journals throughout the school year on issues of his interest. The length of these journals ranged from a few lines to about two pages. The teacher regularly read these journals and commented mainly on their content. In Grades 3 and 4, the students were encouraged to read and write more extended texts. They were also asked to write journals outside the classroom for homework. These were regularly checked and commented on by the teacher. In these grades, correct grammar and spelling usage was encouraged and emphasized but not forced.

The child's native language was Farsi (Persian), an alphabetic language with a writing system close to Arabic but different from that of English in terms of both physical shape and the way the alphabetic letters combine to form an orthographic pattern. When the child began his first grade in English, he had few literacy skills in Farsi. He had just started to attend a Farsi school over the weekends to receive Farsi literacy education. Although the child received little explicit spelling instruction in his English school, he received some spelling instruction in his Farsi school.

Source of data

Data for the study come from samples of the learner's daily dialogue journals and other free writing activities at home and at school from Grade 1 through Grade 4. Due to the large volume of writing taking place in these four years, the analyses focused on writings at two periods in each grade, with each period spanning about two months: one period at the beginning of the grade (September and October or October and November) and the other towards the end (April and May or May and June), with the only difference that the data for Grade 1 were based on samples collected from the end of the grade only, and for Grade 4, the data were from the beginning of the grade only. Altogether, there were six data periods over the four years. None of the writings analyzed involved the use of dictionaries and/or assistance from others.

Data analysis

Data were analyzed in three stages. Initially, all the words in each of the writings were examined and classified as correct or incorrect. A word was classified as correctly spelled if the learner had spelled the word correctly in its entirety. In case a word had different spellings, it was classified as correctly spelled as long as the spelling matched any of the spelling variants of that word. No distinction was made between American and British spellings. In the second stage, analyses focused on the learner's misspellings produced over the four years. Learners' misspellings have been suggested to provide rich information about their spelling development and have been used widely in the L1 research to determine how learners develop their spelling skills over time (e.g., Ehri, 1987; Schlagal, 1992; Varnhagen, 1995; Perin, 1998; Reece and Treiman, 2001 Greenberg *et al*., 2002).

The misspellings were analyzed and coded in terms of their misspelling features, using Ehri's (1992) developmental categories of misspellings (see the next section for details). In order to determine any patterns in the learner's misspellings, the misspellings that shared similar characteristics were grouped and assigned, based on their features, to one of the six developmental stages. The frequencies of these misspellings were calculated and compared across the six data collection periods and the grade levels over the four years. Finally, samples of the frequently misspelled words were selected and their misspelling changes were traced on different occasions to determine if there was any consistency in the changes of the different misspellings of the same word over time. It was assumed that if the development of the spelling is truly stage-like, word-specific changes should also be progressive, moving from simple to more complex structures.

Coding of misspellings

To analyze the data, the learner's misspellings in each period were examined and coded in terms of their developmental characteristics, using a six-stage model of spelling development described in Ehri (1992). According to this model, children go progressively through six increasingly sophisticated stages in their path of spelling development. Each stage is characterized by certain misspellings that children produce before they are able to spell the word correctly (Ehri, 1992). The six developmental stages and their characteristics are as follows.

Preliterate stage: During this stage, learners are developing early print concepts. They have just started to distinguish between writing and drawing. They have not yet developed any knowledge of letter-sound relationships. Therefore, their invented spellings include a series of randomly combined, non-readable, print symbols (e.g., *sd3m* for *red*).

Pre-phonetic stage: In this stage, the learner has learned how to print some of the letters of the word, but has not yet developed full awareness of word segmentation (Gentry and Gillet, 1993). His/her invented spellings show some knowledge of grapheme-phoneme correspondences, but they are partial and contain only some of the sounds of the word. The sounds represented are the most salient sounds and are usually the initial and the final sounds of the word. Middle sounds are not usually represented (e.g., *BD* for *bed*) (Ehri, 1992).

Phonetic or letter-name stage: In this stage, the learner has developed an awareness of word segmentation and has become able to map certain phonemes onto certain graphemes. But the learner still has little knowledge of English orthographic conventions and the rules governing the combination of certain letters in specific words. Spellings are mostly based on pronunciation of the word and segmentation of the word into sounds. In this stage, the learner spells the word as they sound (e.g., *yorz* for *years*). Names of letters may also be used to represent their sounds (e.g., *lak* for *lake*) (Ehri 1992).

Within-word pattern: In this stage, the learner has moved from producing spellings based on sound segmentation to spellings that involve conventional orthographic patterns. Errors at this stage are more complex and include groups of letters that consistently match certain sounds or meanings (Ehri, 1992). Misspellings may include all the letter combinations in the word, but the letters may be used in an incorrect order (e.g., *cluod* for *cloud*, *saet* for *seat)*. Long vowels may be marked by silent *e* (e.g., *rise* for *rice)* or past tenses by *-ed* (*e.g., woched* for *watched*) (Ehri, 1992).

Syllable juncture: In this stage, the learner has developed a good knowledge of sound-letter relationships and also of the orthographic patterns in single words. However, he or she has not yet mastered the knowledge and principles governing syllable junctures or when two syllables come together in multi-syllabic words. Therefore, misspellings happen in the places where syllables are joined. Examples include failure to drop the final *e* or *y* when adding an ending, or failure to double the consonant when adding suffixes to a word (e.g., *takeing* for *taking*, *biger* for *bigger*).

Derivational constancy: Learners in this stage have mastered alphabetic principles including orthographic rules and rules for syllable junctures and know how to apply them when spelling most words. However, they still have problems when spelling words with Latin or Greek origins or those that include complex derivational affixes. Examples include *prodoction* for *production*, *mashine* for *machine, senseable* for *sensible*.

Table 1 presents examples of misspellings, their features, and the stage categories they were assigned to.

Results

The total number of writings examined was 207 and the total number of words examined was 10,509, out of which 1,219 (11.6%) were written in Grade 1, 2,367 (22.5%) in Grade 2, 4,345 (41.3%) in Grade 3, and 2,578 (24.6%) in Grade 4 (see Table 2). Of all the words written in Grade 1, 80.6% were correct and 19.4% were incorrect. In Grade 4, of all the words written, 94.9% were correct and 5.1% were incorrect. Thus, overall, the percentage of incorrect spellings decreased from 19.4% in Grade 1 to 5.1% in Grade 4.

Table 3 shows the mean percentages of different error types in each period and across grades. Percentages were used to adjust for the total number of errors produced in each sample and were calculated by dividing the number of each error type, divided by the total number of errors, multiplied by 100. Table 3 shows the results of these analyses. As can be seen, there were no stage 1 (preliterate) errors in Grade 1. There was a small percentage of stage 2 (pre-phonetic) errors (mean % = 10.9), a high percentage of stage 3 (phonetic) errors (mean % = 68.4), some percentage of stage 4 (within-word pattern) errors (mean % = 7.3), a very small percentage of stage 5 (syllable juncture) errors (mean % = 2.4), and no stage 6 (derivational constancy) errors. In Grade 2, this pattern changed. Stage 2 errors disappeared, the mean percentage of stage 3 errors decreased from 68.4 to 56.8, stage 4 increased from 7.3 to 29.2, stage 5 increased from 2.4 to 8.2, and stage 6 errors were emerging. Similar patterns of increase and decrease in frequencies of error types can be seen in Grades 3 and 4.

Table 1: The learner's misspellings, their features and their stage categories

Spellings		Error features	Classified as
Invented	Intended		
wrm *frt*	*warm* *first*	The invented spelling is partial and represents only the initial and the final consonants.	pre-phonetic (stage 2)
als *fvrt*	*always* *favorite*	The invented spelling is partial and includes some letters of the word, mostly consonants or occasionally long vowels.	
bcom *hlo*	*become* *hello*	The invented spelling includes most of the sounds of the word but not the short vowels.	Letter-name/ phonetic (stage 3)
lik	*like*	Letter names are used to represent sounds.	
yorz *gos*	*years* *juice*	The invented spelling includes all the sounds but is based on how the word sounds.	
becaus *thegngs*	*because* *things*	The invented spelling includes sequences of letters that represent certain sounds.	Within-word pattern (stage 4)
fite *nise*	*fight* *nice*	Final *e* is used to mark long vowel.	
whach *whith*	*watch* *with*	The invented spelling includes overgeneralization of orthographic patterns.	
cacth *sikc*	*catch* *sick*	The error includes orthographic patterns, but with letter reversal.	
laved	*loved*	Past tense markers are spelled correctly.	
hideing *closeing*	*hiding* *closing*	The learner has failed to drop the final *e* when adding the *-ing* ending.	Syllable juncture (stage 5)
suny *shoping*	*sunny* *shopping*	The learner has failed to double the final consonant when adding the *-y* or *-ing* endings.	
prodoction *musition*	*production* *musician*	The invented spelling includes misspelling of the Greek or Latin roots of the words or affixes.	Derivational constancy (stage 6)

A two-way repeated measure analysis of variance (ANOVA) was conducted to analyze the relationship between grade level and misspelling types. The analysis showed a main effect for misspelling types (F = 188.56, $p <$

Table 2: The frequencies and percentages of correct and incorrect spellings in each grade

	Correct	Incorrect	Total
Grade 1	983 (80.6%)	236 (19.4%)	1,219 (11.6%)
Grade 2	2,094 (88.5%)	273 (11.5%)	2,367 (22.5%)
Grade 3	4,004 (92.1%)	341 (7.9%)	4,345 (41.3%)
Grade 4	2,446 (94.9%)	132 (5.1%)	2,578 (24.6%)
Total	9,527 (90.7%)	982 (9.3%)	10,509 (100%)

.001), suggesting that there were differences among the mean percentages of misspelling types in the whole database. The analysis also showed a significant interaction between grade level and misspelling types (F = 10.70, $p < .001$), suggesting a relationship between the two variables. Multiple comparisons between grade levels showed that the learner produced pre-phonetic and phonetic errors significantly more frequently in earlier grades than in later grades. Orthographic and morphological errors (within-word pattern and derivational constancy) were produced more significantly in later grades than in earlier grades (Table 4). These findings show that the frequency of different misspelling types was different in different grades and that there was an increase in the occurrence of more complex misspellings as the learner moved from one grade to the next.

Table 3: Mean percentages of misspelling types within and across grades

Time	Period	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6
		Pre-phonetic	Phonetic	Within-word	Syllable Juncture	Derivational
Grade 1	I	10.9	68.4	7.3	2.4	.0
Grade 2	II	.0	66.9	24.8	4.7	.6
	III	.0	56.8	29.2	8.2	.5
Grade 3	IV	.0	63.1	31.4	1.7	.7
	V	.0	45.1	41.1	9.9	1.0
Grade 4	VI	.0	33.9	47.3	12.2	6.6
	Total Mean*	2.5	57.7	27.7	6.0	1.1

*Total Mean refers to the mean percentage of each misspelling type in the whole database.

These analyses suggest an overall developmental trend. However, a closer examination of the data also showed a fair degree of variability in the child's misspelling performance over the four years (see Figure 1). For example, although there was an overall decrease in the frequency of stage 3 (phonetic)

Table 4: Multiple comparisons among misspelling types

Developmental Stages		Difference Between Grades	P value
Pre-phonetic	(Stage 2)	Grade 1 > Grade 2	$p < .001$
		Grade 1 > Grade 3	$p < .001$
		Grade 1 > Grade 4	$p < .001$
Phonetic	(Stage 3)	Grade 1 > Grade 4	$p < .001$
		Grade 2 > Grade 4	$p < .010$
Within-word pattern	(Stage 4)	Grade 1 < Grade 2	$p < .001$
		Grade 1 < Grade 3	$p < .001$
		Grade 1 < Grade 4	$p < .001$
		Grade 2 < Grade 4	$p < .010$
Derivational constancy	(Stage 6)	Grade 1 < Grade 4	$p < .001$
		Grade 2 < Grade 4	$p < .001$
		Grade 3 < Grade 4	$p < .001$

errors over time, this decrease was not consistent across grades. While there was a decrease in these errors in Periods II and III, there was an increase in Period IV and then again a decrease in Periods V and VI. The frequency of stage 5 errors (syllable juncture) increased from Periods I to III, but then decreased in Period IV, and then again increased in Periods V and VI. Stage 6 errors (derivational constancy) stayed at about the same level of use from Periods II to V, then increased in Period VI. Also if we look at any of the periods, we will see that the learner produced errors belonging to at least four of the six stages of development, though each at a different rate. For example, even in Period I, the learner produced errors belonging to stage 2, stage 3, stage 4, and stage 5. Moreover, although the rate of phonetic errors decreased over time, we still see such errors in all grades. These findings are not consistent with models that depict development as a process in which one behaviour in early stages of development is replaced with more sophisticated ones in later stages. However, they are consistent with a view that considers development as "continuously changing frequencies of alternative ways of thinking" (Siegler, 1996, p. 87), or what Siegler called an overlapping waves model.

The subsequent analysis examined the spelling changes of individual words over time. In these analyses, a sample of frequently misspelled words in the learner's writings was selected and their misspelling features were examined and traced from the time the word was initially misspelled to the time when the learner was observed to have correctly spelled the word at least two consecutive times. A comparison was made between the different misspellings of the same word in the early and later periods to determine how the learner moved from one misspelling to the next with regard to that individual word. These

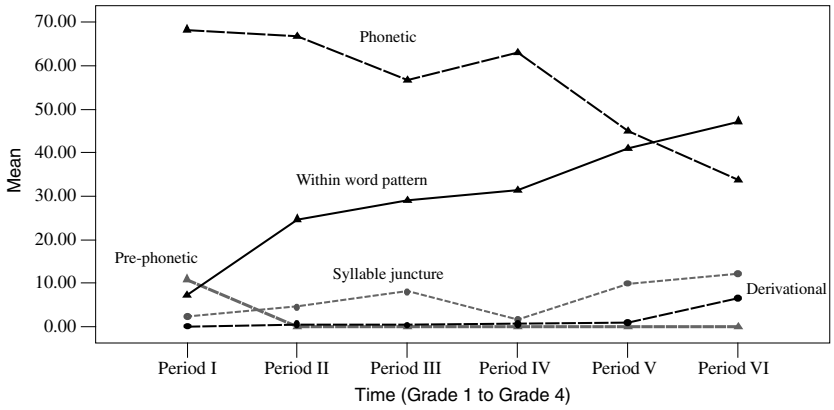

Figure 1: The changes of misspelling types within and across grades

analyses confirmed the interpretation that the learner's path of spelling development was not linear by showing a high degree of variability in the learner's misspelling of the same word at different points in time. A truly stage-like model predicts that we should not see cases in which the initial misspellings of a word are orthographically more complex than its later misspellings. The data, however, showed many such cases (see Table 5 for relevant examples). For example, if we look at the initial and the later misspellings of *apple*, *like*, and *because*, we will see that some of the later misspellings of these words are orthographically less complex than their earlier misspellings. For instance, while the first misspelling of *apple* (*appile*) contains two within-word orthographic structures (a double consonant structure *pp* and a final *le* structure), its third misspelling *(appl*) happening about two months later contains only the *pp* structure but not the final *le* structure, thus representing a less complex orthographic structure. As for the word *because*, the third misspelling (*becaus*) contains the *au* within-word pattern while its fourth and eighth misspellings (*becas* and *becus*) do not. Also, while the initial misspellings of *because* (*becas/becaz*) represent features of a phonetic stage (the word is spelled the way it sounds), the initial misspelling of *apple* (*appile*) represents features of an orthographic within-word stage.

These findings suggest that while for some words the learner had initially used a phonetic strategy, for other words spelled at the same time he had used a more mature orthographic strategy. Such findings regarding the use of different strategies at a given time as well as the use of orthographic strategies at earlier stages of development are not consistent with the assumption that complex spelling knowledge such as morphological and orthographic knowledge is developed and used at advanced stages of spelling development. However, they

Table 5: Examples of misspelling changes of the same word over time

Attempts	Words								
1st	becas	shhol	tosdey	liak	mne	vach	appile	WHINE	WANT
2nd	Becaz	scool	tosday	Lak	mney	wach	appil	Waining	whant
3rd	Becaus	shhool	toseday	LIKE	miny	whach	appl	Wining	WANT
4th	Becas	scolle	tousday	Lik	meny	wach	APPLE	WHINING	WANT
5th	Becase	shool	tusday	LIKE	MANY	WATCH	APPLE	WHINING	
6th	Becous	SCHOOL	tuseday	Lik	MANY	WATCH			
7th	BECAUSE	shool	TUESDAY	LIKE					
8th	Becus	scholl	TUESDAY	LIKE					
9th	Becous	SCHOOL							
10th	BECAUSE	SCHOOL							
11th	BECAUSE								

are consistent with the idea that the development of orthographic knowledge begins very early and that learners use this knowledge to produce new words from the beginning of their literacy acquisition (Bosse, Valdois and Tainturier, 2003; Notenboom and Reitsma, 2003).

Discussion

The present case study examined longitudinally the spelling development of a young ESL learner from Grade 1 through Grade 4. The aim was to determine whether the spelling behaviour of this ESL child could be explained and characterized in terms of spelling stages proposed in the L1 literature and whether a stage-based model of spelling development could account for his spelling performance. The learner's misspelling data were examined for both the overall patterns of spelling growth as well as the developmental changes in the spelling of individual words. Findings provided important insights into the learner's path of spelling development and how the learner learned to spell words in English.

The analysis showed a general pattern of development as the learner moved from one grade to the next. The data showed that the learner produced increasingly more complex orthographic misspellings over time. For example, while he produced pre-phonetic, phonetic, and letter name errors more often in earlier grades, he produced orthographic and morphological errors more often in the later grades.

However, the data also showed that although in general the learner moved from a reliance on using simple spelling patterns toward the use of more sophisticated spelling conventions over time, these developmental changes were more complex than a simple transition from one stage to the next. For example, the analysis showed that while the learner's use of phonetic errors decreased over time, this decrease was not linear. The learner also produced errors belonging to different stages of development, including both early and advanced stages, at any given time. Analyses also showed variability in misspelling when the child spelled the same word at different times. For example, they showed cases in which the learner's initial misspellings of the same word were orthographically more complex than his later misspellings. The data also showed that even when the child was at more advanced stages of development, he still produced misspellings showing features of earlier stages of development.

While these findings provide evidence that the child's spelling behaviour showed a progressive trend, they do not show that one simple behaviour in the early stages of development was always replaced with more sophisticated ones in later stages. Thus, they are not consistent with an invariable stage-like view or the view which proposes that "a child's first step in spelling is to adopt a phonetic spelling strategy" and that children always go forward along

their developmental path not backward (Nunes *et al*., 1997, p. 647). However, they are consistent with a view that considers development as a variable and multifaceted process and one that involves gradual and continuous changes in frequencies of multiple ways of doing and thinking (Siegler, 1996, p. 86), what Siegler called an overlapping waves model of development.

One characteristic of the overlapping waves model is that instead of assuming that children use only one way of thinking at each point in development, it views development as involving multiple use of strategies or "multiple ways of thinking at each point in time" (Siegler, 1996, p. 87). Evidence for such strategic characteristics of development can be seen in the present data. For example, the misspellings of words such as *want* as *whant* or *watch* as *whach* can be taken as evidence for rule abstraction and rule overgeneralization strategies, whereby the learner abstracts an orthographic rule (in this case the *wh* bigram in initial position) and incorrectly applies it to other words. Beers and Beers (1992) reported similar cases with L1 learners with the use of the *-es* plural morpheme. Also, when the learner misspelled the word *Tuesday* as *Tuseday*, it is possible that he had used a phonetic, an orthographic as well as a visual imagery strategy (i.e., spelling as it looks), as the misspelling includes the within-word pattern *use*, represents the sound of the letter *u*, and also looks very much like the word.

Conclusion

In conclusion, this study provided important insights into how an ESL child's spelling knowledge developed over time. It showed a general progressive trend in the spelling behaviour of the child. However, it also showed that the changes in the spelling behaviour did not follow a linear pattern of development from an initial phonetic spelling to a spelling representing more sophisticated orthographic and morphological features. Therefore, the developmental trajectory of this learner seems to be best explained by a spelling development model that views the path of spelling development as strategic and overlapping, rather than one that considers it as truly stage-like.

The implications of these findings, however, should be treated cautiously for theories of spelling acquisition or spelling development in L2 because of the following reasons. First, the study was a descriptive case study, based on data from only one ESL learner. As such the results should not be taken as generalizable to all ESL learners; the contributions of the study should be judged only in terms of its detailed analysis of a single case, something which is missing in much of the L2 research literature (Ortega and Iberri-Shea, 2005). It is clear that in order to be able to arrive at any general principles about spelling acquisition, we need studies that describe and examine the spelling processes in different groups of L2 learners and in different L2 contexts.

Second, it is important to note that the data used in this study come from the learner's naturalistic writings. Although such data are ecologically valid, and indeed have been considered and used for examining spelling development in the field of L1 (e.g., Taylor and Kidder, 1988; Treiman, 1993), naturalistic writings can be restrictive on several grounds. First, in this kind of writing, children may produce only the words they know or they think they know. Thus, if they do not make certain errors related to certain words, it could be because they have chosen not to use those words. Moreover, in naturalistic writings sometimes errors may occur not because the learners do not know the correct spelling of the word but because their attention is on meaning; hence, they may not pay enough attention to the form. These limitations can limit the scope of naturalistic data including the data presented in this study.

Third, there is ample evidence that L1 orthographic characteristics influence L2 reading and spelling processes (e.g., Haynes and Carr, 1990; Geva *et al*., 1993; James, Scholfield, Garrett and Griffiths, 1993; Chikamatsu, 1996; Wang and Geva, 2003). In a study with L2 readers, Wang and Geva (2003), for example, found a difference between the spelling performance of Chinese children using English as a second language and their L1 counterparts. L2 Chinese children showed a poorer spelling performance in spelling pseudowords designed to have a regular orthographic structure than their L1 counterparts. This difference was explained in terms of the L2 children's reliance on using a direct non-phonological route due to their L1 with a logographic writing system. Similar differences have also been identified in other readers coming from other language backgrounds (e.g., Geva *et al*., 1993; Wade-Woolley and Siegel, 1997). Given these findings and also the fact that when the learner in this study was learning English, he was also learning to read and write in his L1, it is possible that his L2 spelling was influenced or constrained by his L1 spellings. Therefore, it is important to examine these influences and find out whether and how the spelling performance of such children are affected by L1 reading and spelling processes. Studies should also examine whether there are any qualitative differences between L1 and L2 learners' path of spelling development and why.

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