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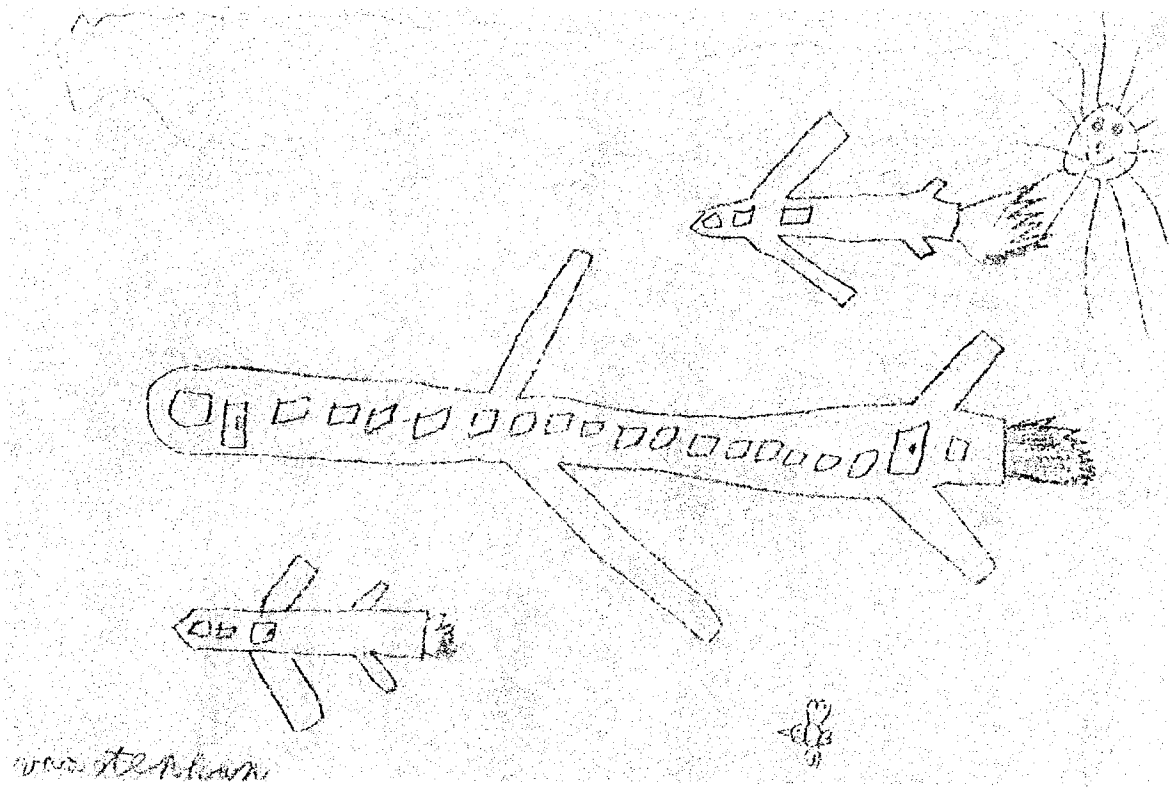
Learning to Spell:
An Alternative Situated View



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Learning to Spell: An Alternative Situated View

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Alternative assumptions about spelling requirements were proposed and elaborated in a spelling training, named 'Visual dictation'. These alternative assumptions pertained to ideas from situated cognition, personal and social epistemologies, and conceptual competence. The central idea is that context is of great importance in learning to spell words. In an empirical study, we investigated the effectiveness of visual dictation for children from three different types of special schools (LOM, MLK, ZMOK) in the Netherlands. Furthermore, we explored the differential effectiveness of this spelling training for two types of words: words with complex consonant clusters and words with an ambiguous phoneme. The results showed that the spelling training was effective for all children. Words with an ambiguous phoneme showed a larger gain than words with complex consonant clusters.

Introduction

With the rise of computer technology, we regard ourselves as ingeniously programmed computers with input, calculation zones and output. Intelligence is considered more and more to be a product of a highly advanced neural network system within the human mind, which works well if the right connections are made. Psychologists try to simulate this intriguing network system with computer models, and artificial intelligence is now a common term within psychological research. Schools are places where the new little computers become programmed. Specific task analysis must provide insight into the skills children need for specific tasks, so that good program material could be developed. Productive thinking, higher order thinking skills, critical thinking and creativity are mostly ignored. The relative slow progress in broader general thinking abilities may result from reducing human beings to computers. Greeno (1989) assumed that the following three framing assumptions about thinking and learning may be responsible for our apparent inability to develop a more adequate theory of thinking:

> "First, the locus of thinking is assumed to be in an individual's mind, rather than in interaction between an agent and a physical and social situation. Second, processes of thinking and learning are assumed to be uniform across persons and situations. Different individuals are more or less capable of critical or creative thinking, and different situations are more or less conducive to learning and thinking, but the activities of thinking and learning are assumed to have approximately the same character wherever and in whomever they occur. Third, resources for thinking are assumed to be knowledge and skills that are built up from

simple components, especially through instruction in school, rather than general conceptual capabilities that children may have as a result of their everyday experience or native endowment" (Greeno, 1989, p. 134).

Greeno (1989) proposes that the notions of situated cognition, personal and social epistemologies and conceptual competence can broaden our vision on human thinking and education. In this thesis I will exemplify the above ideas with the implementation of a 'new' spelling method, visual dictation training. In this part of the thesis I will describe current theories on learning how to spell, and what situated cognition, personal and social epistemologies and conceptual competence can add to these theories.

Learning to spell: The dominant view

The dominant assumption is that learning how to spell could be regarded as the learning and tuning of different strategies with already existing knowledge (van Bon, 1993). It is assumed that the strategies children use will change as a function of their knowledge and experience (Marsh, Friedman, Welch, & Desberg, 1980). The acquisition of spelling strategies thus involves a qualitative change. To stimulate the development of strategies, tasks and instructions are required that are adjusted to the competence of the child. Marsh et al (1980) distinguish three stages in the development of spelling competence. In the first stage, children learn a sequential decoding strategy, in which they learn the phoneme-grapheme correspondence rules. By dividing a word into phonemes and recode them into correspondent letters, a child can write simple words with little specific spelling knowledge. In this stage a child will divide the word *moon* into the phonemes */m/*, */oo/*, */n/* and recode them into the correspondent graphemes and write the word moon. The second decoding strategy to be learned is the use of a hierarchical decoding strategy which is based on conditional rules. For example, the spelling of the sound */K/* depends on the following vowel (i.e., */K/* = c before *a*, *o* and *u* and */k/* = k before *i*, *e* and *y* as in cat vs. kiss). In the Netherlands, at the end of first grade, children are introduced with spelling ambiguities that can be solved by applying rules (Bosman & Van Orden, 1997). In fifth grade, at the age of 10, children enter the third stage in which the use of an analogy strategy in spelling unfamiliar words begins. Instead of decoding words they search for an analogue word and spell the unfamiliar word by analogy to the known word. For instance, the spelling of the word *muscular* is based on the spelling of the word *muscle*. A similar example in Dutch, using the word '*machine*' for spelling the word '*machinaal*'.

According to Marsh et al (1980), each stage has its own difficulty level. Beginning spellers who learn to decode according to the sequential strategy have to dismiss these strategies when they encounter phoneme-to letter inconsistent words. The majority of phoneme-to-letter inconsistent words can be spelled correctly by the application of a set of linguistic rules. But even the most skilled adult spellers are usually unaware that these rules exist or are unable to apply them because of their rather complex nature (Verhoeven, 1979). Even when the analogy strategy is available to a child, it does not guarantee that the child will use it (Marsh, Desberg, & Cooper, 1977). Thus, it is reasonable to expect that for adopting and changing spelling strategies the child needs general thinking abilities for successful fulfillment of a spelling task.

Learning to spell: An alternative view

Situated cognition or *situated learning*, as the names imply, purports that learning is 'situated' in the context in which it is constructed, rather than being an entity outside the context in which it is learned. Knowledge is seen as an integral part of the context in which it is learned and of the experience in which it is developed (Griffin, 1995). Applied to spelling education, learning how to spell is a three-way interaction between the beginning speller, the context and the word itself. Teaching isolated strategies without the context of the whole word or sentence is not very beneficial. Bosman and de Groot (1992) showed that spelling training (i.e., problem naming) which involves practicing solely the ambiguous part of a word, is less effective than conditions in which the whole word is practiced. The context, in this case the spelling training, is very important for optimal spelling progression. Learning how to spell by using the right spelling strategies at the right time, only develops through activity within a spelling context. Transfer from one domain to another does not occur spontaneously without highly specific guidance (Perkins & Salomon, 1989). Results from experimental studies show that reading words, which is often viewed as a closely related skill, does not contribute greatly to spelling ability (Bosman, Van Leerdam & Van Orden, in press; Bosman & de Groot, 1991, 1992).

Personal and social epistemology assumptions focus on the beliefs and understandings children have about their own cognitive functions and skills. Dweck and Leggett (1988) point out that there are differences between individuals in beliefs and understanding about their own knowledge and learning. Children who consider intelligence as a fixed quantity would experience spelling and the tuning of spelling strategies as occasions in which their intelligence

can be assessed and their weaknesses exposed. They will be worried to make spelling errors and always walk the trodden path. They will only use successful strategies, such as sequential decoding strategy, rather than examine new strategies. In contrast, children who consider intelligence as a malleable skill will not be stopped by possible errors they may make when practicing new spelling strategies. They will probably believe that the outcome of successful learning involves trying, which entails becoming smarter in the long run (Greeno, 1989). An environment in which making mistakes is acceptable will stimulate children in exploring other possible strategies. Immediate feedback directed at the preceding process of learning and the teachers' support to further explore strategies is more effective than feedback only aimed at the errors children make (Poulie, 1990).

The *conceptual competence* assumptions emphasize the strong potential capabilities that children have for cognitive growth. They enable children to construct spelling knowledge on their own. Learning how to spell is an activity in which children elaborate and reorganize their knowledge about spelling, rather than simply applying and acquiring spelling strategies. Theorists who adhere to the conceptual competence view emphasize that most teachers do not stimulate children to actively elaborate and reorganize their knowledge about spelling. These teachers explain every spelling strategy over and over again, until the children have adopted it. Children do not get any room for discovering spelling strategies. Therefore, they become passive learners. In the end, children cannot use their supplied spelling tools, because they do not know how to handle them (Brown, Collins & Duguid, 1989). The conceptual competence view assumes that good education does not prescribe and resume everything. Rather, it relies on the potential capacity every child is born with to actively explore a specific environment, such as the spelling of words.

A spelling method which meets the alternative assumptions

Considering the alternative assumptions, a spelling method should meet the following criteria: 1) a spelling method must make use of whole words, rather than focusing on just one part of a word which is difficult; 2) spelling strategies must be learned in a spelling context. Activities which are not related to spelling, must be avoided; 3) immediate feedback directed at the preceding process of learning should be given; 4) the method should explicitly rely on the potential capacity of a child.

The visual-dictation training involves all four criteria. The training starts with the presentation of a written word. The child is encouraged to read the word carefully.

Subsequently, the visual stimulus will be removed and the child will learn to write down the word from memory without a visible printing. After writing down the word, the child must compare its written word with the original. By using this method children are practicing whole words. The activities that take place are all centered around a spelling context. People usually produce the spelling of words from memory when they write. Thus, a training in which the spelling of words are produced from memory will approach the real spelling context more than only reading or copying. By adding a self control phase children are encouraged to closely observe their own learning process. This way, spelling strategies do not need direct instruction, since the children will discover them on their own.

The goal of the present study is to examine the gain of this visual-diction training for children from three different types of special schools. We chose children from special schools as participants, because it is commonly expected that these children do not have the cognitive capacity which is needed for active participation in our present school system. We expected that the visual-dictation training will be successful even for children from special schools. Another aspect we will investigate is the differential effectiveness of this instruction method for different word types.

Method

For this experiment, we selected children from three types of special schools in the Netherlands: Children from a school for learning disabled children (LOM), a school for educable mentally retarded children (MLK) and a school for behavior disordered children (ZMOK)[1].

We chose children with at least two years of spelling education, because some spelling knowledge of the basic phoneme-grapheme relations was needed for successful fulfillment of the experiment.

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[1] Children from LOM schools have in common that they all score around the general mean (IQ between 85 and 110) on an intelligence test. They have learning problems caused by a specific regression within the development of a basic skill, such as reading, spelling or arithmetic. Children from MLK schools have in common that they all score one standard deviation below the general mean (IQ < 85) on an intelligence test. They have a more broadly learning problem. Children from ZMOK schools have in common that they all score around the general mean (IQ between 85 and 110) or sometimes higher on an intelligence test. Their learning problems are caused by behavior problems, such as motivation or concentration problems. Generally, their learning problems are subordinate to their behavior problems.

Participants

From a population of 111 pupils from three different types of schools (40 from a LOM school; 48 from a MLK school; 33 from a ZMOK school), a group of 33 children was selected. Each school provided 11 children. Participation in the experiment was based on their spelling test scores (see Appendix A). In the Materials section, we explain the composition of this spelling test. Children who scored between the range of 47% to 77 % correctly spelled words were selected for the experiment[2]. Table 1 presents the mean percentage of words spelled correctly, age and sex of the children selected for the experiment.

Table 1: Mean age (in months), sex, and mean percentage of words spelled correctly of the children of the three experimental groups.

School type	Age	Boys/Girls	Mean percentage words spelled correctly	N
LOM	137.46 (9.59)	9/2	61 (8.8)	11
MLK	151.36 (9.37)	4/7	64 (10.7)	11
ZMOK	113.82 (10.07)	10/1	64 (9.7)	11
total	134.21 (18.32)	23/10	63 (9.5)	33

Standard deviation between brackets.

To ensure that no a priori differences in spelling skills were present in the three subject groups, analyses of variance were carried out on the mean spelling test scores. These analyses showed that there were no significant differences between the three school types (all F's < 1). Hence, the matching procedure was successful and differences that may occur in this study cannot be attributed to a difference in basic spelling skills at the time of testing.

Materials

For the experiment, two types of materials were used for the selection of participants and for the training.

Selection materials: The spelling test used for subject selection was based on interviews with teachers. Ten teachers (i.e., 6 teachers of the ZMOK-school, 4 teachers of the LOM-school and 1 teacher of the MLK-school) were interviewed to determine frequent spelling problems within the pretest subject population. Some frequently named problems were:

- *problems with ambiguous words, such as:*

[2] By excluding children who scored lower than 47% we wanted to evade errors caused by floor-effects (for more details, see Janssens, 1982). Children who scored higher than 77% were excluded from the experiment, because these children already mastered these word types.

- one-syllable words with -ch of -g, like 'licht' (light) and 'plaag' (plague);
- one-syllable words with -ei of -ij, like 'geit' (gooth) and 'ijs' (ice);
- one-syllable words with -au(w) of -ou(w), like 'gauw' (quick) and 'kou' (cold);
- one-syllable words with -ieuw, -eeuw of -uw, like 'kieuw (gill), 'meeuw' (gull) and 'duw' (push);

• *problems with complex consonant clusters*

- one-syllable words with sch- or schr-, such as 'schaal' (shell) and 'schrift' (excercise-book);
- one-syllable words with more than two consonants following, such as 'strik' (bow).

Thirty Dutch words were selected on the basis of the information supplied by the teachers, to serve as selection materials.

Training materials: Both on basis of the teachers interviews and on the selection test, two types of words were selected for the training: words with a spelling ambiguity and words with complex consonant clusters. The stimuli (ambiguous words and words with complex consonant clusters) were distributed evenly over the training. The training sessions contained three words of both types, each session thus contained 6 words. The total number of stimuli trained in three weeks was 24 (see Appendix B).

Procedure

The description of the procedure will be divided in two parts: the training and the test sessions.

The training: During the training - which took place three times a week - two types of words were trained: words with a spelling ambiguity and words with complex consonant clusters. The training lasted three weeks. Within each week two sets of words of both types were repeated twice. Besides this daily repetition we also included a weekly repetition of two sets of words (see appendix C); over three weeks these sets of words were repeated three times. Each training session consisted of a practice and a test session. In groups of 4 to 6 children, children practiced the training words according to the spelling-instruction 'Visual dictation'. Words were presented on a card for about 4 seconds each. The children were encouraged to observe the words carefully. Next the card was covered, and the children wrote the word into a notebook. The word was then shown again and the children checked its spelling. In case of a misspelling, they corrected and rewrote the word with the card in vision.

The test sessions: Two different types of tests were used: the pretest-posttests and the 'within training tests'.

The pretest-posttests: Before the training started, a pretest (i.e., a word-dictation test) was administered, assessing the children's proficiency on the to-be trained words. One week

later the training started. After the training, two word-dictation tests were administered which ascertained the effect of the training (post-tests). The first post-test was administered one week after the training; the second post-test took place a month later. All three tests consisted of the 24 words which were practiced during the training.

'Within training tests': The 'within training tests' took place after the final training session of each week; the total number of tests during the training was three. Spelling knowledge of all practiced words - 12 within each week - was assessed by dictation.

Results

We conducted analyses on data from both the pretest-posttests and 'within training tests'.

Pretest-posttests. Analyses of variance (ANOVA) were conducted on the data of the word-dictation test. A set of 3 (school type: LOM vs. MLK vs. ZMOK) by 3 (test: pre-test vs. post-test 1 vs. post-test 2) by 2 (word type: ambiguous words vs. consonants clusters)[3] ANOVAs was performed on the number of correctly spelled words, averaged across both subjects and items[4]. This analysis revealed a significant second order interaction between school type, test and word type, $F(4, 60) = 2.75$, $p < .05$ by subjects and $F(4, 88) = 2.48$, $p < .05$ by items. Because of this second order interaction nothing could be said about the effects the different independent variables had on the results. By analyzing the results from each school separately we evaded this problem. Table 2 presents the mean percentage of words spelled correctly, the ambiguous words and words with complex consonant clusters, before and after the training.

[3] The repetition factor mentioned in the section 'procedure' was excluded from the analysis of variance, on account of the unequal distribution of words practiced during the training. For research in which the repetition factor (spaced vs. massed learning) was extensively studied, see Jansen (1990).

[4] We used subject and item analyses so that the results can be generalized to both the population of children from special schools in the Netherlands (LOM, MLK, ZMOK) and to all words that belong to the categories ambiguous words and words with complex consonant clusters.

Table 2: Mean percentage of words spelled correctly before and after the training

	LOM		MLK		ZMOK	
test	ambi (in %)	CC (in %)	ambi (in %)	CC (in %)	ambi (in %)	CC (in %)
pre-test (1 week before)	25.7 (18)	60.5 (14)	37.8 (20)	59.8 (22)	33.2 (13)	72.0 (8)
posttest 1 (1 week after)	46.3 (20)	75.1 (18)	53.8 (24)	75.9 (13)	69.7 (16)	84.0 (13)
posttest 2 (1 month after)	47.8 (24)	81.0 (15)	58.3 (17)	69.6 (18)	59.1 (21)	80.4 (11)

ambi = words with an ambiguity; CC = words with a complex consonant cluster; Standard deviation between brackets.

For each school type, 3 (test: pre-test vs. post-test 1 vs. post-test 2) by 2 (word type: ambiguous words vs. consonants clusters) ANOVAs were performed. These analyses will be described for each school separately in the following paragraphs.

The analyses on the LOM school data showed two significant main effects and a non-significant interaction effect. A significant difference in number of errors among the test moments was present, $F(2, 20) = 23.76$, $p < .001$ by subjects, and $F(2, 44) = 20,57$, $p < .001$, by items. LOM- children made significantly fewer errors on the two post-tests than on the pre-test (Newman-Keuls, both $p's < .01$), though the first and second post tests did not differ significantly. Words with complex consonant clusters were spelled significantly better than words with an ambiguity, $F(1, 10) = 175.68$, $p < .001$ by subjects, and $F(1, 22) = 16.98$, $p < .001$, by items.

The analysis on the MLK school data showed two significant main effects and a non-significant interaction effect. A main effect of test was present, $F(2, 20) = 11.12$, $p < .001$ by subjects, and $F(2, 44) = 15,61$, $p < .001$, by items. MLK- children made significantly fewer errors on the two post-tests than on the pre-test (Newman-Keuls, both $p's < .01$), though the first and second post tests did not differ significantly. Words with complex consonant clusters were spelled significantly better than words with an ambiguity, $F(1, 10) = 33.58$, $p < .001$ by subjects, and $F(1, 22) = 3.38$, $p = .08$, by items.

The analysis on the ZMOK school data showed two significant main effects and a significant interaction effect. The effect of test was, $F(2, 20) = 14.74$, $p < .001$ by subjects, and $F(2, 44) = 19.05$, $p < .001$, by items. ZMOK- children made significantly fewer errors on the

two post-tests than on the pre-test (Newman-Keuls, both p's < .01), though the first and second post tests did not differ significantly. Words with complex consonant clusters were spelled significantly better than words with an ambiguity, F(1, 10) = 84.82, p < .00 by subjects, and F(1, 22) = 10.44, p < .005, by items. However, the significant interaction effect between test and word type qualified this result, F(2, 20) = 10.77, p < .001 by subjects, and F(2, 44) = 4.80, p < .05, by items. Children from ZMOK schools showed a learning effect for both word types, but the scores on the ambiguous words showed a significant decline after the second post test (Newman-Keuls, p < .05). In contrast, for words with a complex consonant clusters no significant difference was detected between the first and second post-tests.

Taken together, the significant second order interaction found in the overall ANOVAs is caused by the deviating pattern of results in the ZMOK-children.

'Within training tests'. During the training, at the end of each week a word-dictation test was administered, containing the twelve words that had been practiced during the week. Only the words which were repeated over the three training weeks were suitable for analysis. A set of 3 (school type: LOM vs. MLK vs. ZMOK) by 3 (test training week: week 1 vs. week 2 vs. week 3) by 2 (word type: ambiguous words vs. words with complex consonant clusters) ANOVAs were performed on the mean number of correctly spelled words. This analysis revealed two significant main effects and a non significant interaction effect. There was no significant difference between school type detected: The children from each school type scored equal on the tests. A main effect of test training week was present, F (2, 60) = 6.79, p < .005 by subjects, and F(2, 8) = 4.93, p < .05 by items. The children scored higher in the last training week (71.2%, SD=22) than in the first (57.6%, SD=20) and the second training week (63.1%, SD=24) (Newman-Keuls, both p's < .001), whereas no significant difference between week 1 and week 2 was detected. Words with complex consonant clusters (76.4%, SD=18) were spelled significantly better than words with an ambiguity (51.5%, SD=25), F(1, 30) = 36.26, p < .001 by subjects, and F(1, 4) = 32.94, p < .005 by items.

Discussion

The goal of this study was to investigate the effectiveness of the spelling training, visual dictation, for children from special schools in the Netherlands, and its usefulness for the training of two word types: words with an ambiguity and words with a complex consonant cluster. We hypothesized that children from special schools would also benefit from the training, as children from elementary school did according to previous experimental research

(van Leerdam, Bosman & van Orden, in press, Bosman & van Hell, in press). The results of our experiment corroborate this assumption: Children from special schools showed a significant learning effect after the training of three weeks. The significant learning effect the children revealed was different for the two word types. The words with complex consonant clusters were spelled better in comparison to ambiguous words, though there was a greater learning effect for the latter.

Documented research in spelling of complex consonant clusters by Dutch beginning spellers and first graders[5] (Van Rijnsoever, 1979) reported that these children showed a tendency to omit the consonants immediately adjacent to the vowel. Van Bon & Uit den Haag (1997) observed that poorer spellers of first grade could be distinguished from better spellers on the basis of specific types of spelling errors they made in words with a complex consonant cluster. The scores of our experiment on words with a complex consonant cluster indicate that problems with these words were less dominant for children of an elder age.

The results of the pretest-posttests data indicate that the children, especially ZMOK-children, had learned more from practicing words with an ambiguity than from words with complex consonant clusters. This result suggests that words with an ambiguity are better suited for our visual dictation. However, the usefulness of training words with a complex consonant cluster according to visual dictation compared with other training methods cannot be assessed without further research. The smaller learning effect could be explained by the higher scores at start which caused a ceiling effect (for more detail, see Janssens, 1982). Another possible explanation can be found in situated cognition theories. These theorists emphasize that the context influences learning. If the spelling context does not approach the nature which the spelling skill demands, learning will be retarded. The skill which is needed for correctly writing words with a complex consonant cluster consists of overhearing the right consonant sequence. A spelling training which draws attention to the acoustic or articulatory characteristics will probably come closer to the required skills than our method did.

Differences were observed in spelling performance of the children from the three types of special schools. In comparison with the LOM- and MLK- children, ZMOK-children showed a deviating pattern of results on the pretest-posttests. In the pretest-posttests the ZMOK-children revealed a significant interaction effect between test and word type. They showed a learning effect for both word types on the first posttest, but the scores on the ambiguous words

[5] Research on the spelling of complex consonant clusters in Dutch children of elder age (e.g. 9 to 11 year) is not available.

declined one month after the training. The data of LOM- and MLK-children revealed no interaction effect. They showed a permanent learning effect for both word types. The deviating results of ZMOK-children in the pretest and posttests may be explained by their behavior problems. The learning problems that ZMOK-children have, are predominately caused by their behavior, and not by a specific or broader cognitive development problem as in the case of LOM- and MLK-children. The attitude towards work and motivation of ZMOK-children is strongly influenced by external factors, such as a training method, teacher, group and so on. If ZMOK-children are stimulated to pay more attention to words they have to learn, they will learn as much as children from a regular school. However, when they loose their interest for the task (e.g. caused by an incident in or outside the classroom) behavior problems can interfere with the learning process (Harbers, 1998).

The within tests data revealed that the children scored significantly better in the last training week than in the first and the second week. This result indicates that the children learned the spelling of the words in the last training week. Thus, the children needed three weeks for practicing the words.

Theoretical implications for the stability of orthographic "representations"

The reduced performance on the second posttest for the spelling of ambiguous words from ZMOK children is an inexplicable result within current dominant accounts about spelling, because traditional theories on spelling assume that the knowledge about the spelling of a word will not change anymore when it is established. These children forgot the spelling of a word they knew a month before.

Most contemporary accounts of spelling acquisition are information-processing-type theories. Within these theories it is assumed that skilled spellers have at their disposal two different, independent processes (or routes) to write a word (Coltheart's Dual-route theory, 1978). Skilled spellers have an abstract word representation in a mental lexicon, from which the spelling of a word can be retrieved on a whole word basis, a procedure known as the lexical route. This may be contrasted with the sub-lexical route, whereby the orthography of a word is assembled by converting the sequence of its constituent phonemes into a sequence of graphemes, using some system of conversion rules. Thus, orthographic representations are considered as the basic fundaments from which correct spelling results. Consequently, these orthographic representations should be stable once well-established.

Dixon and Kaminska (1997) reported that encounters with misspellings can have a detrimental effect on spelling accuracy, even in proficient spellers, and there have been more reports over the years (Frith, 1980; Brown, 1988). These findings and the results of our training would suggest that orthographic representations of the spelling lexicon are dynamic and not separable from its environment. Situated cognition, personal and social epistemology and conceptual competence, mentioned in the introduction provides a broader framework than the conventional accounts, however, the previous claim comes with a caveat.

A caveat

In this thesis I have often used the term 'context' and emphasized its importance for spelling training. 'Context', however, is a comprehensive word. Researchers in situated cognition embodied their theories with experiments which are centered around problem directed education. Hence, they used tangible contexts that were directed to the skills children had to learn. For example, Lave (1988) had a participant in the Weight Watchers diet program who divide a cheese in parts in order to solve an arithmetic question. However, spelling does not have tangible material which can be manipulated for increased spelling insight: The appearance or behavior of a mouse does not give information about the spelling of the word '*mouse*'. For introducing situated cognition theories to spelling education some options are possible: Making spelling tangible for as far as it goes, or restrict the context to the method which is best reflecting the natural demands of spelling.

Spelling can be made more tangible by labeling an object, such as an exercise which exists of placing the right word at the right picture. This is a very time-consuming method which has minimal learning effects according to experimental research (Van Hulten & Verhoeven, 1998). Moreover, there are many words which cannot present by a picture, such as the "abstract" terms, thus this method has a very limited reach. The whole language approach, which is considered by Kulieke and Jones (1993) as an example of situated cognition, tries to make reading and spelling more tangible. A wide range of specific concrete examples with sufficient practice opportunity must make children more motivated for reading and spelling. For example, children choose their own book before reading and reading instructions start. In this case, the context has been used to motivate children for reading or spelling in general, and not as a method for learning specific reading or spelling skills. The spelling context I have presented is restricted to a training method which best reflects the natural demands of spelling.

Concluding remark

In this thesis, I have outlined the importance of alternative assumptions for prospective research in human thinking and spelling education. The introduction of some 'new' terms, such as context, beliefs, and understanding spellers have about their own skills, and faith in potential capabilities for cognitive growth children have, puts specific demands on spelling methods. Within this view, not all spelling methods are equally suitable for teaching spelling strategies. Thus, criteria should beset on the development of new spelling methods. The spelling training, visual dictation has shown to be a good method for teaching the spelling of words with an ambiguous phoneme. It is on hope that further research will clarify the usefulness of other methods for teaching different kind of words and its effectiveness over time for each child as an individual. Such a focus will probably help us escape from the attractive simplicity of one-size-fits-all educational programs (Bosman, Leerdam, & Van Orden, in press).

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References

Bosman, A. M. T., & de Groot, A. M. B. (1991). De ontwikkeling van woordbeelden bij beginnende lezers en spellers [The development of orthographic images in beginning readers and spellers]. *Pedagogische Studiën, 68*, 199-215.

Bosman, A. M. T., & de Groot, A. M. B. (1992). Differential effectiveness of reading and non-reading tasks in learning to spell. In F. Satow & B. Gatherer (Eds.), *Literacy without frontiers* (pp. 279-289). Widnes, Cheshire, UK: United Kingdom Reading Association.

Bosman, A. M. T., & Van Hell, J. G. (in press). Visueel dictee: Een effectieve spelling training [Visual dictation: A effective spelling training]. In L. Verhoeven (Ed.), *Preventie en behandeling van leesproblemen.* Delft, the Netherlands: Eburan

Bosman, A. M. T., Van Leerdam, M., & Van Orden, G. C. (in press). The ecology of spelling instruction: Effective training in first grade. In P. Reitsma & L. Verhoeven (Eds.), *Problems and interventions in literacy development*. Dordrecht, the Netherlands: Kluwer Academic Publishers.

Bosman, A. M. T., & Van Orden, G. C. (1997). Why spelling is more difficult than reading. In C.A. Perfetti, M. Fayol, & L. Rieben (Eds.), *Learning to spell* (pp. 173-194). Hillsdale, NJ: Lawrence Erlbaum Associates.

Brown, A. S. (1988). Encountering misspellings and spelling performance: Why wrong isn't right. *Journal of Educational Psychology, 4*, 488-494.

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher, 18*, 32-42.

Coltheart, M. (1978). Lexical access in simple reading tasks. In G. Underwood (Ed.), *Strategies of information processing* (pp. 151-216). New York: Academic Press.

Dixon, M., & Kaminska, Z. (1997). Is it misspelled or is it mispelled? The influence of fresh orthographic information on spelling. In R. Treiman (Ed.), *Spelling* (pp. 169-184). Dordrecht: Kluwer Academic Publishers.

Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review, 95*, 256-273.

Frith, U. (1980). Unexpected spelling problems. In U. Frith (Ed.), *Cognitive processes in spelling* (pp. 495-516). New York: Academic Press.

Greeno, J. G. (1989). A perspective on thinking. *American psychologist, 44*, 134 - 141

Griffin, M. M. (1995). You can't get there from here: Situated learning, transfer, and map skills. *Contemporary Educational Psychology, 20*, 65-87.

Harbers, J. H. (1998). *Zijn spellingvaardigheden gesitueerd?* [Are spelling skills situated?]. Honour's thesis, Department of Special Education, University of Nijmegen, the Netherlands.

Janssens, J. M. A. M. (1982). *Ogen doen onderzoek*. [Eyes do research]. Lisse: Swets & Zeitlinger B.V.

Kulieke, M. J., & Jones, B. F. (1993). Fourth invited response: Cognitive instructional techniques in relation to whole language approaches. *Remedial and Special Education, 14*, 26-29.

Lave, J. (1988). *Cognition in practice*. Cambridge, UK: Cambridge University Press.

Marsh, G., Desberg, P., & Cooper, J. (1977). Developmental changes in reading strategies. *Journal of Reading Behavior*, *9*, 391-394.

Marsh, G., Friedman, M. P., Welch, V., & Desberg, P. (1980). The development of strategies in spelling. In U. Frith (Ed.), *Cognitive processes in spelling* (pp. 339-353). London: Academic Press.

Perkins, D.N., & Salomon, G. (1989). Are cognitive skills context-bound? *Educational Researcher*, *18*, 16-25.

Poulie, M.F. (1990). Wat orthopedagogen en leerkrachten over motivatie mogen weten. [What remedial teachers and teachers may know about motivation]. In Van Bon, Lieshout, & Bakker (Eds), *Gewoon, ongewoon, buitengewoon: Opstellen over leerproblemen* (pp. 298-311). Rotterdam: Lemniscaat.

Van Bon, W. H. J. (1993). *Spellingproblemen: Theorie en praktijk* [Spelling problems: Theory and practice]. Rotterdam: Lemniscaat.

Van Bon, W. H. J., & Uit de Haag, I. J. C. A. F. (1997). Difficulties with consonants in the spelling and segmentation of CCVCC pseudowords: Differences among Dutch first graders. In R. Treiman (Ed.), *Spelling* (pp. 49-72). Dordrecht: Kluwer Academic Publishers.

Van Hulten, M. & Verhoeven, S. (1998). *Ei of ij, au of ou???*. Honour's thesis, Department of Special Education, University of Nijmegen, the Netherlands.

Van Rijnsoever, R. (1979). Spellingen van voorschoolse kinderen en eersteklassers [Spellings of preschool children and first graders]. *Gramma*, *3*, 169-197.

Verhoeven, G. (1979). Verbeelding en werkelijkheid; Spelfouten in de opstellen uit verschillende typen van onderwijs [Imagination and reality: Spelling errors in essays from different types of education]. *Tijdschrift voor taalbeheersing*, *1-2*, 146-163.

Appendices

Appendix A

The spelling test used for subject selection; English translations in parentheses; Target spelling problem is underlined.

1	soms (sometimes)	11	vriend (friend)	21	zweet (sweat)
2	friet (chips)	12	circus (circus)	22	rits (zipper)
3	strand (beach)	13	nacht (night)	23	ploeg (plough)
4	gierig (miserly)	14	koning (king)	24	blijf (to remain)
5	flauw (tasteless or silly)	15	kruipt (to crawl)	25	zonk (to sank)
6	langs (along)	16	prachtig (beautiful)	26	hoofd (head)
7	plooi (pleat)	17	mars (mars)	27	iglo (igloo)
8	erg (bad, or awful)	18	gezeur (to bother)	28	duwtje (a push)
9	kieuw (gill)	19	geeuw (yawn)	29	geitje (small goat)
10	scheert (to shave)	20	kiezen (molars)	30	einde (end)

Appendix B

Words with an ambiguous phoneme used for the training; English translations in parentheses; Target spelling problem is underlined; In the columns the items percentages spelled correctly.

	LOM-school			MLK-school			ZMOK-school		
stimuli	pre	post-1	post-2	pre	post-1	post-2	pre	post-1	post-2
drijfhout (drift-wood)	18	46	46	36	73	73	36	73	64
blauwbaard (bleubeard)	18	73	46	73	73	100	27	64	73
levensecht (lifelike)	18	55	64	27	64	64	64	82	73
geheimzinnig (mysterious)	9	9	36	9	27	27	0	18	27
politie (police)	18	46	73	36	46	46	0	91	46
bouwval (ruin)	9	46	27	27	27	36	55	64	64
achterlijf (abdomen)	46	64	64	55	100	91	36	73	64
reizigers (traveller)	18	27	18	9	27	18	9	46	46
nieuwigheid (novelty)	9	9	27	9	46	46	9	46	27
schiereiland (peninsula)	55	55	64	90	60	90	55	82	55
zeemeeuw (sea gull)	64	73	64	82	82	100	82	100	91
fluweel (velvet)	27	55	46	9	46	27	27	100	82

pre = pretest; post-1 = posttest 1; post-2 = posttest 2.

Words with complex consonant clusters used for the training; English translations in parentheses; Target spelling problem is underlined; In the columns the items percentages spelled correctly.

	LOM-school			MLK-school			ZMOK-school		
stimuli	pre	post-1	post-2	pre	post-1	post-2	pre	post-1	post-2
borstkas (chest)	18	36	46	18	27	18	64	64	91
kunsthandel (art shop)	73	64	100	55	64	82	91	82	91
trommelstok (drum stick)	27	36	36	36	64	55	0	64	46
glinsteren (sparkle)	73	82	100	36	55	46	55	100	73
zwerfkatten (alley cat)	18	73	82	36	91	82	36	73	73
melkkruk (milk stool)	82	82	91	100	100	91	91	91	91
kerstbal (Christmas ball)	91	100	100	82	91	82	100	91	91
stripboeken (comic books)	82	82	82	82	100	100	100	91	73
krulspelden (curlers)	64	91	100	82	91	82	91	82	91
marktkoopman (market vendor)	82	82	64	64	73	55	82	91	73
rotstreek (rotten trick)	82	100	100	64	100	91	82	91	91
hoestbui (coughing fit)	36	73	73	64	55	73	73	91	82

pre = pretest; post-1 = posttest 1; post-2 = posttest 2.

Appendix C

Training design; repetition factor: within the week (not shaded), and over the week (grey shaded); offered words during the training; English translations in parentheses.

	Day 1		Day 2		Day 3	
Week	**ambi**	**CC**	**ambi**	**CC**	**ambi**	**CC**
1	drijfhout (drift-wood)	borstkas (chest)	geheimzinnig (mysterious)	borstkas (chest)	geheimzinnig (mysterious)	glinsteren (sparkle)
	blauwbaard (bleubeard)	kunsthandel (art shop)	politie (police)	kunsthandel (art shop)	politie (police)	zwerfkatten (alley cat)
	levensecht (lifelike)	trommelstok (drum stick)	bouwval (ruin)	trommelstok (drum stick)	bouwval (ruin)	melkkruk (milk stool)
2	drijfhout (drift-wood)	kerstbal (Christmas ball)	achterlijf (abdomen)	kerstbal (Christmas ball)	achterlijf (abdomen)	glinsteren (sparkle)
	blauwbaard (bleubeard)	stripboeken (comic books)	reizigers (traveller)	stripboeken (comic books)	reizigers (traveller)	zwerfkatten (alley cat)
	levensecht (lifelike)	krulspelden (curlers)	nieuwigheid (novelty)	krulspelden (curlers)	nieuwigheid (novelty)	melkkruk (milk stool)
3	drijfhout (drift-wood)	marktkoopman (market vendor)	schiereiland (peninsula)	marktkoopman (market vendor)	schiereiland (peninsula)	glinsteren (sparkle)
	blauwbaard (bleubeard)	rotstreek (rotten trick)	zeemeeuw (sea gull)	rotstreek (rotten trick)	zeemeeuw (sea gull)	zwerfkatten (alley cat)
	levensecht (lifelike)	hoestbui (coughing fit)	fluweel (velvet)	hoestbui (coughing fit)	fluweel (velvet)	melkkruk (milk stool)

ambi = words with an ambiguity; CC = words with a complex consonant cluster