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The Role of Phonological Mediation in Word Recognition in Reading

1. Introduction

This chapter is the outcome of my work as a foreign language teacher. Teaching English as a foreign language gives us a unique opportunity to experience once more, although in a different way, our own learning – the journey to the mastery of a foreign language that we began a long time ago and in which we are still participating. Being a teacher also encourages us to observe our students' learning and explore issues related to foreign language learning.

The chapter focuses on the role of phonology in word recognition in reading. The choice of the topic was deliberate. It was my intention to discuss the issue that would be of interest to the addressee of the book in which this discussion was to be published. I begin with a few reflections concerning my interests in the issue discussed in this chapter. In the next part I explain theoretical perspectives which serve as a framework for the discussion about phonology. This leads to looking at phonological operations in word recognition in L1 and L2/FL reading as well as the role of phonological processing in fluent reading, as presented by the Carver rauding theory (1992).

2. A Few Words about My Interests in Reading

As far as I remember, I have been always interested in reading, partly because I simply like reading. I recall my secondary school literature classes and discussions that aimed to answer the "old" question: what did the author of the text want to say? I remember doing library research to find what literary critics think about the texts that I was reading and how their views compared with mine. I can still hear my teachers' questions about the texts we were analyzing; now I understand their exploratory nature.

They aimed to stimulate students' thinking and encourage the class to look at the texts in a more critical manner. I remember my teachers' attempts to make us talk about texts and "academic discussions," which we sometimes considered vague and directionless. These memories came back during my work as a foreign language teacher. I recall discussing with students the text. Having discussed the multiple choice questions that accompanied the text, the students came to the conclusion that all of the suggested answers in the questions were somehow incorrect. One of my students approached me after the class with disappointment in his voice, asking about the sense of discussing reading comprehension questions, if no unequivocal answers can be reached.

The picture of myself as a reader became richer and more complex when at secondary school I began to read English texts and later as a student of the English Institute at the Jagiellonian University I learnt to analyze British and American literature. I asked myself the question to what extent my reading in Polish was similar to my reading in English, and keeping in mind my secondary school stormy discussions about texts, to what extent my ability to talk about texts in English was similar to my ability to talk about them in my mother tongue. All these questions returned, although in a different form, when I began teaching.

Most of my professional life has been connected with teaching undergraduate students of a foreign language teacher training college at the Jagiellonian University. My experience as an EFL teacher and a teacher trainer fed into the rationale of the research that I am currently conducting. Although my study (which is not presented in this paper) is not directly related to phonology, I believe that to obtain a more complete picture of reading, an understanding of the role of phonology in both L1 and FL reading is necessary. It is worth noting that recently the complexity of phonological processing (phonemic awareness, orthographic processing, subvocalization, etc.) has been the focus of a number of L2/FL studies and the importance of L1 phonological processes in L2/FL reading has been emphasized, e.g. Birch (2002).

3. How is Reading Conceptualized in This Paper?

It is useful to realize that reading has been widely studied and held the interest of various disciplines, such as philosophy, psychology, education, artificial intelligences and linguistics. Treated as an ability without which learners cannot develop their language competence, it has been always

in the centre of first language and foreign language education. Within the applied linguistics field reading research is a little more than one hundred years old. The psycholinguistic perspective focuses on cognitive processes of the reader during the reception of texts, whereas the sociocultural view examines social factors of text production and reception. Literary theories provide interesting insights into the role of author, text and reader in text interpretation. Linguistics enhances understanding of how language and discourse can be perceived. It seems that only by considering an array of disciplines and perspectives can we build a richer, more complete, although not less complex, picture of what reading involves. This knowledge can raise awareness about an interplay between theory and research, which can help us to design and structure research in a more "informed" way. It could also make us reflect on the effectiveness of our teaching practices and encourage us to adapt new approaches to our students and their learning.

In this chapter reading is discussed within a psycholinguistic orientation. To elucidate differences between L1 and L2/FL reading, a componential cross-linguistic view on reading is taken. A psycholinguistic perspective conceptualizes reading as a set of mental operations during which the reader creates his/her own representation of the text. A componential view of reading, in contrast to a unitary perspective, "dissects reading into its components" (Koda 2007: 1), allowing researchers to explore constituent components of the reading comprehension process. In theory and empirical research two levels of cognitive processing are usually distinguished: "lower" – focusing on letter identification, word recognition and syntactic parsing; and "higher"– involving discourse processing and knowledge about text characteristics, which enable readers to construct his/her representation of the text. Initially componential analyses focused on L1 reading (e.g., Carr and Levy 1990); recently a growing number of studies (e.g., Bernhardt 2000; Bernhardt and Kamil 1995; Schoonen, Hulstijn and Bossers 1998; Shiotsu 2003) have emphasised the usefulness of this approach in conducting cross-linguistic analyses that investigate how different elements of L1 reading influence L2/FL reading processing.

4. The Importance of Phonological Decoding in Reading

This chapter focuses on the phonological component in reading. It discusses the role of phonological decoding in word recognition. At the be-

ginning of this section, it is important to explain the terms "word recognition" and "decoding," which are often used interchangeably. In this discussion the term "word recognition" refers to a process that consists of two components: decoding, which involves extracting phonological information from words and semantic access, which entails obtaining words' meanings.

Phonological decoding has been found an important factor facilitating both L1 and L2 reading. In L1 phonological decoding enhances information storage in working memory; changing print into its phonological form enables effective access to oral vocabulary (e.g., Gough 1975), which is stored in phonological forms. In fact, competence in pronouncing printed words was found as a reliable predictor of early reading success (e.g., Share and Stanovich 1995). Interestingly, the undeniable importance of phonological decoding was found in both alphabetic languages, e.g., English and nonalphabetic ones, such as Chinese and Japanese (e.g., Perfetti and Zhang 1995). Working-memory experiments (e.g., Zhang and Simon 1985) investigating the role of phonological competence and visual encoding in retaining visually presented material point to phonological transformation as a more helpful factor. Similar results, underlining the importance of phonological processing in word reading were obtained in a series of studies conducted by Breznitz and Berman (2003), who investigated word reading rate of young and adult readers of English as an L1. Although the studies showed the difference between the two groups (among the young readers word reading rate relates to phonological processing at the phoneme level, while among the adult readers word reading rate relates to phonological processing at the word level), across all the subjects word reading rate was found to relate more to auditory-phonological processing than to visual-orthographic processing.

5. The Role of Phonological Mediation in Word Recognition

The functioning of the phonological subsystem is discussed in detail in reading models that focus on the bottom skills of the reading process. For example, Samuels and Kamil (2002) in their model of reading underline the importance of phonological memory as a mediating link between visual and semantic memory. Visual units (e.g., words, letters) are receded in phonological memory into sound units and then passed on to semantic

memory, where they are processed into meaning. The linguists (Samuels and Kamil 2002: 204) claim that:

> Despite claims that skilled readers may be able to go directly from print to meaning without the need for a phonological receding stage, there seems to be common agreement that beginning readers as well as skilled readers who are reading difficult text engage in phonological receding.

The question whether recognition of the printed word is mediated by some version of its spoken equivalent (often named "inner speech" or "subvocalization") has been investigated within the phonological recoding hypothesis first offered by Rubenstein, Lewis and Rubenstein (1971). Drawing on the assumption that the mental lexicon is phonologically organized (Gough 1975), the hypothesis holds that prior to word recognition two stages are accomplished. First, the string of letters is converted into a string of phonemes, which is followed by a search in the mental lexicon for an entry which matches this phonological form and finally by word recognition. It is important to emphasize that the hypothesis denies that word recognition is preceded by any form of speech or subvocalization since phonemes are abstract, hypothetical entities. Numerous studies were conducted to check the hypothesis, however their results fail to support its predictions concerning the existence of phonological mediation in the process of word recognition. Additionally, clinical studies of brain-damaged patients (Saffran and Marin 1977) undoubtedly showed that there must be a different route to the mental lexical than phonological receding. The experiments indicate that patients who lost an ability to recognize the spelling-sound correspondences (presumed by the phonological receding hypothesis) and therefore unable to decode pseudowords can still correctly recognize many words.

The discussion concerning the hypothesis gave rise to the assumption that the skilled reader may have a dual access to his/her internal lexicon: one direct, the other involving phonological receding (see Coltheart *et al*. 1979; McCusker, Hillinger and Bias 1981; Meyer, Schvaneveldt and Ruddy 1974). The two routes are assumed to operate in parallel, with word frequency being an important factor influencing the speed of the direct route. This theory seems to explain why even skilled readers phonologically recede unfamiliar words; it also accounts for the absence of phonological mediation in reading familiar words.

The presence of phonological mediation in silent reading has been investigated under the term of subvocalization or silent speech. Linguists and teachers discuss the nature of this phenomenon as well as its advantages and disadvantages in fluent reading and comprehension. Early studies, e.g., Edfeldt (1960), claimed that good readers are less likely to subvocalize and that easy texts "provoke" less "silent speech" than difficult ones. Kleiman (1975) concluded that resorting to phonological recoding was not helpful in understanding individual words but could facilitate reading longer stretches of text, which involves "semantic integration" and consequently more demand on short-term memory. Dooley and George (1988) showed that subvocalization improves comprehension and retention of complex material. Similarly, Swanson (1984) found that subvocalization is more likely to occur when reading is more difficult and requires heavier load on memory, e.g. in the case of comprehension questions.

The issue of sounding out words while reading has been also researched by cognitive psychologists within their studies of memory. Baddeley (1999) focused on what he calls the articulatory or phonological loop, i.e. a process of rehearsal, usually via subvocal speech, whose main aim is to maintain the memory trace. He and his colleagues (e.g., Baddeley, Eldridge and Lewis 1981) conducted a series of experiments which indicated that suppressing subvocalization does not affect the speed of reading and understanding the gist of the text. However, it makes readers less sensitive to errors in text, such as wrong word order. The researchers (Baddeley, Eldridge, Lewis 1981: 1) concluded that "subvocalization allows the creation of a supplementary articulatory code, which is produced and utilized in parallel with other aspects of reading. Such a code seems particularly suitable for monitoring order information." The linguists claim that the role of subvocalization depends on a kind of reading performed by the reader. Baddley (1999: 53) says:

> You probably use it [subvocalization] when reading difficult prose – a legal document, for example – where accurate understanding is essential, but I suspect that you do not subvocalize very much when reading a novel. You might well argue that, although you do not subvocalize, you still think you hear a voice when you read; I suspect that this "voice" is based on another system, an auditory imagery system, related to but different from the articulatory loop.

It seems that the function of an auditory imagery system would help the reader to develop his/her interpretation of the text.

Similarly, Smith (1994: 160) in his discussion why the reader can give special attention to specific words, for example in reading poetry, explains that sounding out words in the text does not so much contribute to a literal comprehension as "establish a different – a complementary or alternative – kind of mood or meaning." This assumption is shared by Eysenck and Keane (1995: 315), who conclude that apart from reducing the memory load in comprehension inner speech "may provide the prosodic structure (e.g. rhythm, intonation, stress) that is lacking in written text but present in spoken language." Ridgway (2009) assumes that subvocalization can be important in monitoring more affective and interpersonal aspects of language, especially where the text resembles speech, e.g. in reading poetry and drama.

Subvocalization is a phenomenon discussed also in relation to reading in a foreign language. In fact, FL readers are aware of a more laborious subvocalizing taking place in their mind in reading in a foreign language than in their native language (Ridgway 2009). A significant difference between reading in a foreign language and reading in one's native language is that FL readers are less familiar with the phonology or prosody of the language. Developing a phonological store of words that FL learners can automatically recognize in written text is a factor that will undoubtedly contribute to more fluent and understandable reading. Many linguists (e.g., Eskey 1993) emphasize the role of automatic word recognition in FL reading. It often happens that FL readers, especially those less skilled and at lower level of language competence, encounter words that they have never seen in written text before. It seems that sounding out words in such situations can facilitate associating written words with their spoken equivalents; more efficient recognition and understanding of such vocabulary can contribute, thereby, to better comprehension of the text. It can be assumed that because of weaker linguistic competence reading in an FL is a cognitively more demanding task for short-term memory (Birch 2002) and subvocalization may help in the same way as it does in L1 reading.

6. Word Recognition in the Rauding Theory

Carver's rauding theory (1992) offers new insight into the role of word recognition in reading. It also provides clear practical clues in relation to teaching instruction, which will be discussed at the end of this sec-

tion. The word "rauding" is a combination of two words: "reading" and "auding"; it was developed by Carver (1977) to focus on the similarity between reading comprehension and listening comprehension. Carver (2000: 3) explains that his aim was to investigate processes that underline the act of comprehending the text "without regard for whether the words in the sentences are (a) being read as they are looked at in printed text, or (b) being auded as they are read aloud by someone else."

The author distinguishes five reading "gears": scanning, skimming, general reading (called by Carver rauding), study reading and memorizing. At various levels of comprehension information is retained to a different extent. Scanning involves searching for a word, a phrase or a symbol and the comprehension level is nearly zero. The words are not held in short term memory for any time at all, if they are not the target words. In skimming words are skipped, but the words that are given more attention are retained in memory. Learning and memorizing require more analytical reading; they take more time, involve rehearsal and more frequent regressions. Rauding reading, also called normal reading, involves "attending to each consecutive word in sentences and comprehending each consecutively encountered complete thought in a passage, . . . comprehending about 64% or more of the thoughts in a passage" (Carver 2000: 405).

In this approach an ability to recognize words quickly and efficiently plays the key role in the process of reading. Carver (2000: 405) hypothesizes that an advanced reader would be at the raudamaticity point, which means that he/she has raudamatized all of his/her audamatized words. Saying differently, an experienced reader is able to decode automatically and understand quickly words that he/she knows when spoken and which he/she is able to pronounce when presented in print. The reader can do it at his/her own rauding rate, which he/she has achieved through overlearning. "The rauding rate of an individual . . . is also likely to be the fastest rate at which the individual can read relatively easy material and still comprehend accurately" (Carver 2000: 76). Rauding rate is constant for an individual, but it varies between individuals. Ample investigations of college students (Carver 1990 cited in Carver 2000) confirmed the existence of the five reading gears and indicate that readers can change speed of processing the text (along with the purpose of their reading). The rauding rate (gear 3) was estimated at around 300 words per minute; memorizing (gear 1) at around 138 words per minute, or even lower; learning

(gear 2) at around 200 words per minute; skimming (gear 4) at around 450 words per minute; and scanning (gear 5) at around 600 words per minute.

The theory assumes that the accuracy of comprehending the text can be accurately predicted given certain information concerning the text difficulty and the individual ability. Drawing on his theory, Carver designed a model containing precise mathematical equations, which have been applied in both L1 and L2 reading research. For example, the rauding theory has been applied to explore factors that contribute to primary school children's reading comprehension (Rupley 1996). The relationships among cognitive power, auditory accuracy level, pronunciation (word recognition) level, rauding (comprehension) accuracy level, rauding rate (reading rate) level, and rauding efficiency (reading comprehension rate) level were examined. The analyses supported the Carver model. Also research in FL reading draws on the rauding theory and its causal model of reading efficiency. Asano and Sudo (2006) tested the assumption that the processing time for reading had an effect on that for listening. They found that the increase in reading rate and vocabulary skills contributed to better scores of both reading and listening comprehension tests. In a similar experimental study conducted among Japanese college students of English, Hirai (1999) observed that optimal listening rates and reading rates are also similar among learners of English as a foreign language. Lee (2006) reanalyzed the study of Nassaji and Geva (1999), who concluded that efficiency in phonological and orthographic processing contributed noticeably to individual differences in adult FL reading. The study provided strong support for the rauding theory.

In summary, it seems that the rauding theory has stimulated studies of reading in both L1 and FL, underscoring the role of lower level processing in reading. The use of the same statistical analysis procedure enables researchers to compare components responsible for L1 and FL reading efficiency. The results of the studies lend support for the rauding theory's model of reading achievement with advanced FL learners. They also seem to confirm the assumption that the same processes underlie reading and listening in both an L1 and FL.

7. Teaching Implications

The rauding approach offers important pedagogical clues to teachers. Educators are advised to distinguish different types of reading and instruct

their learners that there is no one way of reading. The main aim of reading instruction should be to encourage learners to develop their individual rauding rate. This can be achieved by means of raudamaticity training and vocabulary training. Raudamaticity training entails the raudamatization of audamatized words, i.e. words that are comprehended when listening are practiced until they can be recognized quickly in print. Vocabulary training simply involves learning new words in context. In both cases computer technology can be of considerable help. Additionally, frequent practice and reading easy material for enjoyment is recommended.

Another important teaching implication of the rauding approach is that it does not ask learners to read materials that contain unknown words; instead students should read texts which contain words that have undergone raudamaticity training and need to be practiced in context. Any new words should be read aloud by the teacher so that students can learn their pronunciation. Educators and students are warned against textbooks and manuals that promise quick improvement of reading rate (McLay 2007). It is important to be aware that such materials can help learners to improve their skimming, which does not allow good comprehension of the text. Students are advised to be careful about exercises (e.g., Wassman and Rinsky 2000 cited in McLay 2007) which suggest that learners use a card to cover the words as they are read in order to prevent regressions. Such practice is most likely to reduce comprehension and frustrate readers.

8. Summary

In summary, research evidence clearly indicates that word recognition is an important component of the reading process. It shows that subvocalizing is a necessary part of silent reading. Many studies imply that sounding out words facilitates functioning of the short term memory in processing text information; it is particularly helpful in coping with unfamiliar vocabulary as well as in careful reading and in reading difficult texts. As regards teaching, suppression of silent speech should be avoided. Instead developing sight vocabulary (i.e. words recognized in print) and extensive reading for pleasure are recommended in both L1 and FL reading. Educators should keep in mind that the main aim of reading instruction is to promote fluent and understandable reading, which is not equivalent with speed reading. It is crucial that learners be aware of their reading purpose and work on systematic development of their normal reading rate.

It is important to underline the role of the rauding theory in both L1 and FL reading research. Its theoretical assumptions and the methodology that the theory offers invite researchers to investigate the relationship between reading comprehension and listening comprehension as well as to compare components that underline processes in both skills in an L1 and an FL. The cross-linguistic research based on the theory underlines the importance of lower processing in reading, implying that in both languages listening and reading are underpinned by similar components.

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