Clarification of L2 reading theories through the analysis of empirical studies

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The aim of this paper is to clarify the existing debate in the literature concerning the interactive nature of reading and the role of bottom-up and top-down processes in second language (L2) reading. In order to fulfil this objective we analyze the research conducted regarding the role of background knowledge in L2 reading comprehension. Specifically we focus on the interrelation between language proficiency and background knowledge and between gender and background knowledge in L2 reading comprehension. We can conclude that the analysis of the literature clearly shows that background knowledge has an effect on both males and females' reading comprehension. It also supports the interactive nature of reading which suggests that reading comprehension requires the interaction between linguistic and background elements. Contrasting findings are nevertheless obtained with respect to the relative effect of proficiency and background knowledge on the learners' reading comprehension performance. The analysis carried out in the present paper points out the need for more studies that analyze the effect of the different aspects of the L2 reading process that are involved in the interactive process of reading comprehension and help clarify the existing contradictory conclusions. Some pedagogical implication can also be drawn from this work. It is clear from the studies analyzed that teachers should take advantage of the significant effects of background knowledge and proficiency on learners' comprehension performance.
Keywords: L2 reading model, background knowledge, language proficiency, gender, reading comprehension.

Clarificación de teorías de lectura en segunda lengua a través del análisis de estudios empíricos. El objetivo de este artículo es clarificar el debate existente en la literatura respecto a la naturaleza interactiva de la lectura y el papel de los procesos basados en el texto y basados en el conocimiento en la lectura en una segunda lengua. Para llevar a cabo este objetivo, realizamos una revisión de la literatura que aborda el papel del conocimiento previo en la comprensión lectora en una lengua segunda. En particular, nos centramos en la interrelación entre competencia y conocimiento previo y entre género y conocimiento previo en la lectura en una lengua segunda. Podemos concluir que el análisis de la literatura muestra claramente que el conocimiento previo tiene un efecto significativo en la comprensión lectora de hombres y mujeres. Además, apoya la naturaleza interactiva de la lectura. Se obtienen, sin embargo, resultados contradictorios con respecto al efecto relativo de la competencia y el conocimiento previo en la comprensión lectora. El análisis llevada a cabo en este trabajo señala la necesidad de más estudios que analicen el efecto de los diferentes aspectos involucrados en el proceso interactivo de la lectura y que clarifiquen las conclusiones contradictorias existentes. El presente trabajo tiene, asimismo, implicaciones pedagógicas. Así, los estudios analizados muestran claramente la necesidad de tener en cuenta el efecto del conocimiento previo y la competencia en la lectura de los aprendices.
Palabras clave: Modelo de lectura en lengua segunda, conocimiento previo, competencia lingüística, género, comprensión lectora.

There has been an ongoing debate in the reading research literature as to the relative importance of the bottom-level and the top-level processing levels in fluent reading comprehension. The top level is constituted

by the knowledge system, that is, the schematic knowledge. Complementarily, the bottom level is constituted by the language system, i.e., the informant's knowledge of the second language (L2) at the various linguistic levels (systemic knowledge). Some researchers have argued for the primacy of higher-level skills, minimizing the role of basic lower-level word recognition processes in fluent reading (e.g., Cziko, 1980; Goodman, 1996; Smith, 1994). Other researchers have argued for the importance of lower-level textual and word recognition processes in addition to that of higher-level processes even in advanced readers (e.g., Daneman, 1996; Stanovich, 2000).

Most current reading comprehension models are interactive in that L2 reading comprehension is considered a process involving the combination and integration of various sources of knowledge including both lower-level and higher-level knowledge sources (e.g., Bernhart, 2003, 2005; Carrell, Devine, & Eskey, 1988; Lee, 1997; Nassaji, 2002; Nuttall, 1998). These models take both levels into account. They acknowledge discourse as the actual process of meaning negotiation between participants in a communicative interaction, in the case of reading, the reader and the writer.

The aim of this paper is to clarify the existing debate in the literature concerning the interactive nature of reading and the role of bottom-up and top-down processes in second language (L2) reading. We will try to clarify the relevance of both the schema theory and the threshold level hypothesis. In order to fulfil this objective we will analyze the research conducted regarding the role of background knowledge in L2 reading comprehension.

Bernhardt (2003) claims that half of the variance in L2 reading is accounted for by first language literacy (20%) and second language knowledge (30%), and includes background knowledge as a factor involved in the remaining variance. She shows the need for studies that deal with the remaining 50% of the variance. In fact, research that has examined familiarity of content as a key

variable in comprehension has reached different conclusions and research works have contrasting findings. All this suggests a need for further investigation.

In order to carry out our work we have collected and analyzed the papers concerned with this issue in the best known international journals. We have focused on papers that deal with the effect of background knowledge on L2 reading comprehension and the interrelation of background knowledge and two other factors, proficiency and gender, and their effect on L2 reading comprehension. We have focused on the works that have been published since the year 2000. The journals selected deal with reading and language learning: *Reading in a Foreign Language*, *Journal of Reading Behaviour*, *Reading Research Quarterly*, *The Reading Matrix*, *Journal of Verbal Learning and Verbal Behaviour*, *Modern Language Journal*, *Language Learning*, *Applied Language Learning*, *Forum on Public Policy: A Journal of the Oxford Round Table*, *The Canadian Modern Language Review*, Discourse processes, *TESOL Quarterly* and *Applied Language Learning*.

Research on the role of background knowledge in L2 reading comprehension

Research on the interaction between background knowledge and proficiency in L2 reading comprehension

We concentrate in this paper on Schema Theory to show how background knowledge has an effect on both L1 and L2 reading comprehension. The role of background knowledge in language comprehension has been formalized as schema theory. Schema theory is based on the idea originally suggested by Bartlett (1932) that human memory consists of high level structures known as schemas, each of which encapsulates our knowledge about everything connected with a particular object or event. These schemas represent the general knowledge which aids the understanding of conversations and texts, as well as real-life events. A schema

theory is a theory about how knowledge is represented and about how that representation facilitates the use of the knowledge in particular ways. According to schema theories all knowledge is packaged into units. These units are the schemas or schemata. Embedded in these packets of knowledge is, in addition to the knowledge itself, information about how this knowledge is to be used. Each schema contains many components, parts, or "slots", which are hierarchically linked, representing the relationships among the components relative to the schema in question. The knowledge stored in schemata interferes with the interpretation of new information (Anderson & Pearson, 1984; Carrell, 1991). If new information is incomplete, the reader makes inferences on the basis of the selected schema in order to fill in the missing parts.

The literature shows that background knowledge has an effect on both L1 and L2 reading comprehension. Studies into L1 reading comprehension show that world knowledge has strong effects on readers' construction of meaning from a text, that the interpretations that readers give reflect the use of their backgrounds knowledge, and the familiarity with the cultural content schematic area of the text facilitates reading comprehension. Moreover, frequency with which certain strategies are used differ according to whether subjects are reading a culturally familiar or a culturally unfamiliar passage (e.g. Afflerbach, 1990; Anderson & Pichert, 1978; Beaugrande, 1980; Carrell, 1983; Pritchard, 1990). Findings in L2 reading comprehension also point out that the cultural origin of a text affects the subject's understanding of information from the text and that differences in existing knowledge about the content of text materials may be an important source of individual differences in reading comprehension (e.g. Carrell, 1981; Johnson, 1982; Steffensen, Joag-dev, & Anderson, 1979).

In addition to the role of background knowledge in reading comprehension, the potential interaction between background knowledge and learners' proficiency also

concerns researchers in reading. One crucial point of research in this area has been to clarify whether L1 and L2 readers process text in the same way since the L2 reader may be faced with the problem of language competence ceiling which affects text processing. That is, the bidirectionality of L1 text processing (top-down/bottom-up) cannot effectively occur. This is the so-called Threshold Hypothesis.

Research findings are inconclusive. On the one hand, there is evidence for the view that L2 readers process text in a bottom-up direction, and on the other, research shows that L2 readers seem to be directed in a top-down direction. It is not surprising that this is so since there are too many factors affecting text processing (namely, proficiency level, age, literacy, oral orientation of society, etc.).

Among those who present evidence for a bias towards a bottom up direction in L2 processing are Carrell (1983), Clapham (1996), Clarke (1979), Cziko (1978), Hammadou (1991), Horiba (1996, 2000), Keshavarz, Reza, and Ahmadi (2007), Taillefer (1996) and Usó-Juan (2006). Carrell's (1983) study showed that higher proficiency students recalled more from content-unfamiliar texts than from content-familiar ones. Her results suggest that ESL readers seem to be totally dependent on decoding linguistic skills, not utilising therefore processes which activate content schematic knowledge because of their lack of systemic competence. Clarke's (1979) and Cziko's (1978) data have also revealed that L2 reading comprehension is based on decoding skills because systemic competence places a ceiling on their reading skills. These researchers argue that the good reading skills of the L1 reader are not directly transferred to L2 reading, for the restricted command of the systemic knowledge on the part of the L2 reader causes what Clarke (1979) has called a "short circuit" in the good reader's system. Nevertheless, both Cziko (1978) and Clarke (1979) found evidence that the good L1 readers still did better than the poor L1 readers at the same level

of L2 systemic competence when reading an L2 passage. That seems to show that something other than linguistic competence is operating, ie, good L1 readers are activating schematic knowledge.

Hammadou (1991) sought to investigate whether prior knowledge of a topic enables better inferencing and whether, in turn, this was mediated by general proficiency levels of L2. Hammadou showed that less advanced learners were not able to compensate for lower language proficiency by being familiar with the topic.

Horiba (1996, 2000) and Taillefer (1996) found that L2 readers drew heavily on their linguistic ability when they were reading various L2 texts. Taillefer (1996) found that as the reading task became more cognitively complex, the role of linguistic ability became even more crucial. Taillefer also found that as the learners in these studies became more proficient, reliance on textual and linguistic processes did not decrease. These studies suggest that linguistic deficiency constraints the reading comprehension process and that limited language proficiency leads to inefficient processing of the text.

In a study of students' academic English reading proficiency, Clapham (1996) found a stronger effect of language proficiency on students' comprehension than background knowledge. Whereas poor language proficiency prevented her respondents from compensating for their lack of understanding by using an appropriate strategy, the linguistically proficient readers in her sample could "compensate for a certain lack of background knowledge by making full use of their language resources" (Clapham, 1996: 196).

Usó-Juan (2006) carried out a study to estimate, by means of regression techniques, the contribution of background knowledge (discipline-related knowledge) and English-language proficiency to reading comprehension in English for Academic Pursposes (EAP). She also analysed the compensatory effect of discipline-related knowledge and English-language proficiency on EAP read-

ing, that is, whether strength in one of these two areas, that is, discipline-related knowledge or English-language proficiency, can compensate for weakness in the other area. She tried to specify the levels at which the compensatory effect between the two variables takes place for successful EAP reading, The participants' existing discipline-related knowledge was measured by Usó-Juan (2006) by giving them knowledge tests on the topics and areas of her research (psychology, marketing and industrial engineering). The participants in the study were native Spanish-speaking undergraduates who exhibited a wide range of proficiency in English as a foreign language and knowledge of the topics being tested.

She concludes that: (a) discipline-related knowledge and English-language proficiency always contribute to EAP reading performance. The higher the participants' discipline-related knowledge or English-language proficiency, the better the participants' EAP reading performance will be; (b) English-language proficiency level predicts an EAP reading level from two to three times better than does discipline-related knowledge. (c) Finally, successful EAP reading is possible without discipline-related knowledge if the participants' English proficiency level is advanced or intermediate. However, if the participants have a low level of proficiency in English, successful EAP reading is possible if the participants reach a linguistic threshold and have discipline-related knowledge. The linguistic threshold is not fixed, given that it changes gradually depending on the existing discipline-related knowledge; that is, the higher the discipline-related knowledge, the lower the linguistic threshold will be.

This same result is obtained by Keshavarz, Reza, and Ahmadi (2007) who investigated the effects of linguistic simplification and content schemata on reading comprehension and recall. The participants were students of English as a foreign language. Data analyses showed a significant effect of the content and EFL proficiency, but not of the linguistic simplification, on

reading comprehension and recall. The findings indicate the existence of a language proficiency threshold above which content and proficiency interaction appears.

Another group of researchers present results that suggest a bias in the top-down direction in L2 reading comprehension: Al-Shumaimeri (2006), Carrell (1981), Chen (1995), Hudson (1982), Johnson (1981), Koh (1984), Mohammed & Swales (1984) and Steffensen, Joag-dev, and Anderson (1979).

With two passages about an Indian wedding and an American wedding, Steffensen, Joag-dev, and Anderson (1979) reported that participants read the native culture content-oriented passage faster and recalled a larger amount of information from the native passage independently of their systemic knowledge proficiency in English.

Carrell (1981) examined the comprehension of advanced ESL Japanese and Chinese subjects using folktales from different cultural orientations. Her findings showed that the cultural origin of the text affected the subject's recall of information from the texts, as well as the subjects' judgments of the level of difficulty of the texts more than their linguistic difficulty.

Johnson (1981) showed that the schematic knowledge of the text has more effect than its linguistic complexity level on the reading comprehension of her subjects (intermediate and advanced ESL students). They tended to have problems in reading unadapted texts (ie., not syntactically and semantically simplified) when they were not familiar with the cultural content schema of the text. However, the same was not true when comprehending a passage with whose cultural content schemata they were familiar.

Likewise, Koh (1984) showed that the ESL readers she used in her research performed better when reading texts whose content schematic area was related to their field of study, independently of their systemic knowledge proficiency in English. Her results clearly indicate that ESL readers with low systemic knowledge of English perform significantly better when reading texts with whose content schematic area they are familiar.

Hudson (1982) set up an experiment to investigate the role of schematic knowledge in L2 reading comprehension. More particularly, he was concerned with showing the effects of externally induced content schemata on L2 reading and its relationship with the L2 reader's linguistic proficiency level. Roughly, the same issue addressed by Koh (1984), although in her research design content schemata were not externally induced but already part of the subjects' background knowledge. Contrary to Koh's (1984) results, which show that L2 readers perform better when reading texts with whose content schematic area they are familiar, irrespective of their linguistic proficiency level, Hudson's (1982) findings reveal that content schemata inducement had a stronger effect on the reading comprehension of his ESL subjects at the beginning and intermediate levels of linguistic proficiency. He posits that this seems to show that different levels of linguistic proficiency affect the ability to use schematic knowledge and that schema inducement can override the lack of systemic knowledge on the part of the reader.

Mohammed and Swales's (1984) study describes a procedure for investigating the reading of instructions (using a video-camera set up). The experimental task was the setting of a digital alarm clock using the manufacturer's instructions. The performance of a small sample of subjects was studied against two parameters: degree of competence in English and the extent of experience in scientific fields. Results show that once a threshold in English reading ability has been passed, field-familiarity is a much stronger indicator of rapid and successful text processing than native-like competence in the language.

Chen (1995) investigated the effect of language proficiency and domain specific knowledge on the comprehension of science texts by Chinese graduate students studying in Canada. Analysis of variance revealed that domain-specific knowledge exerted

strong effects on the recall of propositional information, but no significant effect of L2 language proficiency was found.

A group of recent studies offer evidence for the interactive nature of reading and find significant effects both of background knowledge (content familiarity) and language competence. Al-Shumaimeri (2006) studies the effects of language ability and content familiarity on foreign language reading comprehension. The participants of this study were undergraduate English language students from two different levels, lower and higher-ability students.

He used two texts from a reading textbook, one familiar and the other unfamiliar. The results showed that content familiarity facilitated reading comprehension. Moreover, language ability had a significant effect on the comprehension performance of students at different levels. High ability students performed better on both the familiar and unfamiliar texts. It suggests that the high-ability students passed beyond the necessary threshold level as they seemed to have enough linguistic knowledge to read and understand the texts without difficulty.

Low-ability students performed better in the test related to the familiar text than in the test related to the unfamiliar text. However, the performances of the high-ability students showed no significant differences between the familiar and the unfamiliar texts. The lack of prior knowledge seems to have affected the low-ability students but not the high-ability students. Language ability level may have played a compensatory role in facilitating the comprehension of the unfamiliar text. This possibility can be supported by the interactive model of reading.

Nassaji (2003) investigated the role of higher–level syntactic and semantic processes and lower–level word recognition and graphophonic processes in adult English as a second language reading comprehension. This study demonstrated an important relationship between the various components of reading skills and ESL reading comprehension. Lexical knowledge showed the strongest contribution to the discrimina-

tion between skilled and less-skilled readers with a sample of fairly advanced ESL readers. However, the contribution of efficiency of word recognition and graphophonic processes was also significant. This latter finding suggests, in Nassaji's opinion, a clear link between the efficiency of these component processes and competence in ESL reading comprehension.

Donin, Graves, and Goyette (2004) carry out a within-subject cross-language study of text comprehension in adult second language learners. Text comprehension and sentence reading time measures were obtained for matched narrative and procedural texts in English and French from adult learners of French as a second language at two levels of French proficiency. The language of the text and readers' L2 proficiency affected reading times, while text type did not. Analyses of the recall performance suggest that, while linguistic proficiency may limit the representation that an individual can construct of a text, the constructed representation reflects the individual's conceptual base as well as strategic processing.

Research on the interaction between background knowledge and gender in reading comprehension

In order to continue with our analysis of the effect of background knowledge on reading comprehension, we will approach a series of studies that analyze the relationship between gender and background knowledge in reading comprehension and try to clarify whether gender interacts with background knowledge to account for differences in reading comprehension performance.

Al-Shumaimeri's (2005) examined gender differences in reading comprehension in relation to the familiarity of gender-neutral texts. The students, tertiary level male and female intermediate students of English as a foreign language, belonged to two levels of general L2 proficiency: lower and higher-ability students.

Participants read a familiar and an unfamiliar text and performed a multiple-choice question test to measure their reading com-

prehension performance. Al-Shumaimeri (2005) found that topic familiarity had a facilitating effect on the reading comprehension of both the male and female student readers. This supports the schema theory. He also found gender differences in learners' foreign language reading comprehension with male students significantly outperforming their female counterparts in both tests.

One possible explanation given by Al-Shumaimeri (2005) for the superiority of the male students in this study is based on the threshold level theory as he explains that males and females may not have been equally matched in language ability. The male students seem to have passed above their threshold level for these two texts as they seemed to have enough linguistic knowledge to read the texts without great difficulty.

Keshavarz and Ashtarian (2008) investigate the relationship between text types and reading comprehension as well as whether gender affects the relationship between text type and comprehension. A reading comprehension multiple-choice test made on three types of text (history, essay, and short story) was administered to EFL university learners at the intermediate level.

The results show that familiarity with the type of text has a facilitating effect on second language reading comprehension at the intermediate level. The results also show that male and female EFL learners differ in their reading comprehension ability with females having a better performance both in each type of text type and in general.

Shokouhi and Parvaresh (2010) compared the effects of two different kinds of post-adjunct reading comprehension assessment on a group of high school and pre-university students of gender-neutral authentic and non-authentic expository texts. Among the results obtained, a significant superiority in the subjects' reading comprehension was found when they answered the texts with the post-adjunct reading comprehension questions. This study then supports that background knowledge inducement has a positive effect on reading comprehension.

Unlike the previous studies, they found that there were no significant gender differences in the comprehension of texts.

Conclusions

We have tried to clarify the existing debate in the literature concerning the interactive nature of reading and the role of bottom-up and top-down processes in L2 reading. To this end we have carried out a thorough analysis of the literature concerned with the interrelation between background knowledge and reading comprehension performance. Specifically we have focused on the interrelation between language proficiency and background knowledge and between gender and background knowledge in L2 reading comprehension.

We can conclude that the analysis of the literature clearly supports the schema theory according to which knowledge of text content can facilitate reading comprehension by providing a knowledge structure to which readers can compare and fit pieces of incoming information. Moreover, from the analysis of the studies that approach the interrelationship between learners' gender and reading comprehension, we can affirm that background knowledge has an effect on both males and females' reading comprehension.

The analysis of the literature also supports the interactive nature of reading, which suggests that reading comprehension requires interaction between the linguistic elements in the text and the background elements in the reader.

Contrasting findings are nevertheless obtained with respect to the relative effect of proficiency and background knowledge on the learners' reading comprehension performance. Several studies find stronger effect of language proficiency on students' comprehension than background knowledge. Moreover, they conclude that proficiency could compensate for lack of background knowledge, something which can be supported by the interactive model of reading. These studies indicate the existence of a

language proficiency threshold, thus supporting the threshold theory. Students need to pass beyond the threshold level so that the interactive process involving the combination and integration of various sources of knowledge can effectively take place.

In contrast, several studies show that background knowledge has a stronger effect on L2 reading comprehension than linguistic proficiency. Findings show that readers can understand the texts independently of their proficiency.

It is then evident that more studies are needed to shed some light on the effect of the text-driven and reader-based aspects of the L2 reading process that are involved in the interactive process of reading comprehension and clarify these contradictory conclusions. These studies will have to take into account the large number of factors that, as we have seen in the literature, affect text processing.

The analysis we have carried out of the literature seems to reflect a compensatory processing in which some sources help or substitute other inadequate or non-existing sources, that is, what they use to compensate for such deficiencies. This agrees with Bernhardt's (2005) most recent L2 reading model which tries to recover the conceptualizations of the L2 reading process as a

switching process in cognition, that is, as the learning process progresses, compensatory mechanisms vary according to the needs. Experimental studies are needed to determine the validity of this tendency as this can only be determined through experimentation.

From a pedagogical point of view, it is clear from the studies analyzed that language teachers need to take advantage of the significant effects of background knowledge and proficiency on learners' comprehension performance. First, they could help poor learners develop the necessary skills to understand the texts by providing them with familiar texts. Subsequently, they could gradually introduce more difficult texts, with more unfamiliar topics as the students' competence improves. In this way they will be helping students combine and integrate both lower-level linguistic sources and higher-level in an effective way.

Teachers should also focus on teaching different types of texts, with different topics regardless of their students' gender. The selection of the texts can be a shared by teacher and learner, depending on the learners' interest, motivation and purpose. Teachers should also provide a good selection of activities and focus on the teaching of a large variety of strategies to make the progress towards autonomy easier.

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