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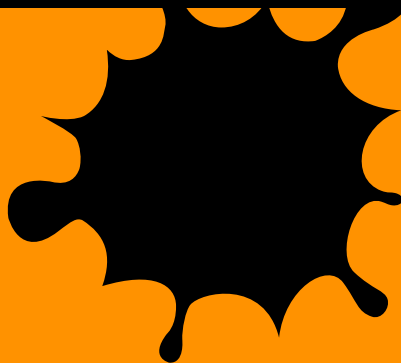
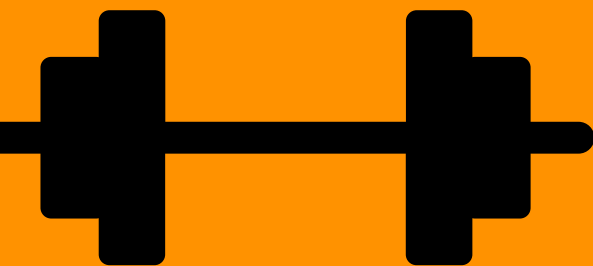
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# ISSUES IN EDUCATION

EDITORS

MÁRIO CRUZ & CRISTINA PINTO



**issuEs'21**

# **ISSUES IN EDUCATION**

**EDITORS**

**MÁRIO CRUZ & CRISTINA PINTO**

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# 4.

## READING COMPREHENSION AND LEVEL OF REPRESENTATION IN SPANISH: A STUDY IN PRIMARY SCHOOL CLASSROOMS

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### **Abstract**

Reading is a very complex process that requires the development of skills ranging from the most basic ones, such as decoding words and basic comprehension of sentences, to more complex abilities such as the elaboration of the mental model of the text, in a process that develops throughout the primary education stage. The present research examined the influence of the level of representation (text base and mental model) on the reading comprehension of narrative and expository texts of children aged between 8 and 11 (4<sup>th</sup> to 6<sup>th</sup> grade of primary school). Comprehension of each text was assessed through a multiple-choice questionnaire that included a series of explicit and implicit questions, and each variable was analysed using a series of correlational methods, such as Pearson's  $r$  and ANOVA. Results show that students tend to obtain higher scores on the creation of the text base compared to the mental model. In fact, the scores in reading comprehension of children from the 4<sup>th</sup> grade depended significantly on the level of representation that the questions addressed, while the results of children from the 5<sup>th</sup> grade onwards are not so dependent on the type of questions asked. Therefore, these results show how in 4<sup>th</sup> grade the mental model of the students has not developed fully yet

compared to the creation of the simpler text base and how it improves with age and experience.

Keywords: reading comprehension, reading, Spanish, mental model, primary education.

## Resumen

La lectura es un proceso muy complejo que requiere del desarrollo de habilidades que van desde las más básicas, como la descodificación de palabras y comprensión básica de oraciones, a las más complejas como la elaboración del modelo mental del texto, en un proceso que se va desarrollando a lo largo de la etapa de educación primaria. La presente investigación examinó la influencia del nivel de representación (base textual y modelo mental) en la comprensión lectora de textos narrativos y expositivos de niños de entre 8 y 11 años (de 4º a 6º de primaria). La comprensión de cada texto se evaluó mediante un cuestionario de opción múltiple que incluía una serie de preguntas explícitas e implícitas, y cada variable se analizó mediante una serie de métodos correlacionales, como la  $r$  de Pearson y el análisis de la varianza ANOVA. Los resultados muestran que los estudiantes tienden a obtener puntuaciones más altas en la creación de su base textual en comparación con el modelo mental. De hecho, las puntuaciones en comprensión lectora de los niños de 4º dependen significativamente del nivel de representación que abordan las preguntas, mientras que los resultados de los niños de 5º en adelante no dependen tanto del tipo de preguntas formuladas. Por lo tanto, estos resultados muestran cómo en 4º curso el modelo mental de los alumnos aún no se ha desarrollado completamente en comparación con la creación de la base del texto base y cómo este mejora con la edad y la experiencia.

Palabras clave: comprensión lectora, lectura, español, modelo mental, educación primaria.

## 1. INTRODUCTION

Reading comprehension is a very complex process that requires the mastery of multiple skills that range from the most basic ones such as decoding, to more complex tasks, namely inference making and the elaboration of a mental model (Cuetos Vega, González Álvarez & de Vega Rodríguez, 2015; Yildirim et al., 2020).

The Construction-Integration model (one of the most influential models of text comprehension in cognitive psychology) suggests that readers recall first the surface elements of the text, which allows them to create its simplest minimal form, i.e., the text base. Afterwards, readers incorporate their previous knowledge and experiences, reading strategies and inferences which, together with non-linguistic skills (such as memory, attention, and so on), help them create the mental model of the text and finalize its comprehension (Kintsch, 1988; Kintsch, 1998; Graesser,

2007; van Dijk and Kintsch 1983; Vieiro Iglesias & Gómez Veiga, 2004). Together, the text base and the mental model, create the level of representation of the text. However, being able to create a complete mental model of a text is a difficult task that requires a certain degree of expertise and, therefore, primary schoolers find it a very challenging task (Adams, Bell & Perfetti, 1995; Bowyer-Crane & Snowling, 2005; Catts, Adlof & Weismer, 2006; Florit, Roch & Levorato, 2011; De Mier, Borzone, Sánchez Abchi & Benítez, 2013, Perfetti & Stafura, 2015).

The present study aims to analyse how the level of representation is related to reading comprehension results on a sample of Spanish-speaking children aged between 8 and 11 (4<sup>th</sup> to 6<sup>th</sup> grade of primary school), and to observe if there is any difference between grades.

## **2. THEORETICAL APPROACH**

Although there are many definitions that explain reading comprehension, a common component implies the creation of a coherent mental representation on the reader's brain that takes place throughout the reading process (McCrudden & Kendeou, 2012). In fact, reading comprehension is a complex process that requires the coordination and interaction of a series of abilities. In order to understand any type of text, the reader must recover the meaning of each individual word, connect said meanings to create the global meaning of each sentence and integrate the meaning of each sentence with the inferences as well as their previous knowledge (Cain & Oakhill, 2009; Kieffer, Petscher, Proctor & Silverman, 2016; Schmitz, Gräsel & Rothstein, 2017).

First, the reader must be able to understand the main ideas that appear on each sentence and link those ideas together (Vidal-Abarca et al., 2012). This representation is called the text base and it focuses on understanding the information that appears explicitly on the text. This type of knowledge allows the reader to search for specific information in a text and helps them connect the basic ideas that the text transmits (Kintsch, 1988; León, Martínez-Huertas, Olmos, Moreno & Escudero, 2019).

However, due to the fact that the messages do not communicate explicitly all the information that is necessary to achieve an effective comprehension, otherwise the text would become too long and tedious, readers must develop the ability of filling in the gaps through inferences and suppositions, which are based on their previous knowledge in order to create a whole representation of the written text (Turner & Bowey, 1984; Oakhill & Cain, 2007; Ramírez Leyva, 2015).

Depending on the author, we can identify different types of inferences from the simplest, such as identifying the referent of a pronoun, to the most complex, such as being able to understand the causality that connects the different ideas expressed

on the text with the previous knowledge (van den Broek, 1994; Oakhill & Cain, 2007; McKoon & Ratcliff, 2017).

Following the example proposed by León (1996) and León et al. (2012), adapted into English for this paper, in order to fully understand the following text, we have to make a series of inferences that connect the information explicitly stated on it with our previous knowledge about the world, the text genre and the context of the text:

Although Rose has spent the last two years working intensively on a script, she was not able to finish it. Finally, after a final push, she gave it to her editor. She recovered the credit of her readers and, three years later, won a prize for best original screenplay (León, 1996; León et al., 2012).

The reader should be able to infer that Rose is the proper name of a female writer and it is not referring to a flower, script refers to the text of a play or movie, credit has the meaning of reputation or prestige and it does not have anything to do with banks, and pronouns such as she and her are referring to Rose. In addition, the reader has to know that the main job of a scriptwriter is to write a play, a hard and arduous activity that takes plenty of time, that writers usually have a following of readers that expects a certain quality on the works they read, that scripts are necessary to create a film, that sometimes films win prizes, and so on. Finally, through this text we can also infer that the script was a success, that before the publication of the script the writer was criticized for another less elaborated work, that the writer probably spent plenty of time writing the script because she wanted to regain her popularity and win an award, that she probably worked very hard and it was an arduous and tiring process, and so forth. As we can see, some inferences are harder to make than others and some of them require the integration of previous knowledge about the world. Once the reader has inferred all this information, they have built up the mental model of the text.

To sum it up, in order to fully understand the meaning of a text, the expert reader has to combine both implicit and explicit knowledge that will allow them to create their text base and mental model of the text respectively. However, primary school children are still developing their reading skills and, thus, they have more trouble answering questions that require them to activate their previous knowledge (and create the mental model of the text) compared to more explicit questions that form the text base (Adams et al., 1995; Bowyer-Crane & Snowling, 2005; Catts et al., 2006; Florit et al., 2011; De Mier et al., 2013; Perfetti & Stafura, 2015).

### **3. METHODOLOGY**

The present study aims at analysing how the level of representation reached on a text is related to reading comprehension results on a sample of Spanish-speaking children aged between 8 and 11 (4<sup>th</sup> to 6<sup>th</sup> grade of primary school), and if there is any difference between grades. To do so, we performed both descriptive and



inferential analyses, the latter consisting of a series of correlational methods such as Pearson's  $r$  and ANOVA.

Following the previously stated theoretical framework, we hypothesise that students of all grades will obtain higher results on the creation of their text base of both texts compared to the creation of the mental model. In addition, due to an improvement in reading skills, in the generation of inferences and a higher experience with diverse texts, we believe that students in higher grades will obtain higher scores in both measures (especially in the mental model) compared to students in lower grades.

### **3.1. Participants**

The sample consisted of a total of 310 students (164 girls and 146 boys) randomly selected from three public schools in Galicia. The sample was divided into three groups according to their grade: a 4<sup>th</sup> grade group of 128 participants (Average age = 8.9767, SD = 0.4413), a 5<sup>th</sup> grade group of 77 participants (Average age = 9.975, SD = 0.4766), and a 6<sup>th</sup> grade group of 105 participants (Average age = 11.084, SD = 0.4976). All students agreed to participate in the study and had parental consent. We did not include in our sample students with learning disabilities.

### **3.2. Instruments**

In order to carry out this research, we have used the battery ECOMPLEC-Pri Test, Evaluation of Reading Comprehension for Primary School Students (León et al., 2012), an evaluation instrument that measures the scores obtained by children between the 4<sup>th</sup> and 6<sup>th</sup> grades of primary education in a narrative and an expository text. The characteristics of the texts are as follows:

A) A narrative text, entitled *El hombrecillo sabelotodo* [The Little Know-it-all], consisting of 514 words in a dialogue format with a narrative structure, which includes a total of 22 reading comprehension questions about the text with three answer options each.

B) An expository text, entitled *Los glóbulos rojos* [The Red Blood Cells], consisting of 348 words divided into two paragraphs that follow the characteristic structure of academic texts, similar to that of textbooks, with a large number of technical terms and concepts that have been adapted to the age of the participants. The text includes a total of 21 reading comprehension questions with three response options each.

### 3.3. Procedure

The ECOMPLEC-pri battery tests were conducted in each participant's regular classroom under the supervision of the classroom tutor and the examiners, following the standards listed in the manual.

This battery was corrected using the TEACorrige software, a computer program provided by the battery itself which, after inserting the data, automatically corrects the responses using a series of algorithms. As a result, the program provided us with a results sheet per participant containing a series of variables on the score obtained in both tests (see Figure 1).

Figure 1

Profile sample



Note. Profile generated from [ww.teaediciones.com](http://ww.teaediciones.com). Copyright 2011 by TEA Ediciones S.A.

### 4. RESULTS

This section includes the results of the statistical tests performed on the scores obtained by the sample.

## 4.1. Descriptive Analysis

The software provided us with a total of 9 variables that we divided by grade (4<sup>th</sup>, 5<sup>th</sup> or 6<sup>th</sup>). Table 1 provides an overview of the results.

Table 1

Mean results of the sample divided by grade

Variable	4 <sup>th</sup> grade (n = 128)	5 <sup>th</sup> grade (n= 77)	6 <sup>th</sup> grade (n= 105)
General Comprehension	44.45	53.83	52.05
Narrative Text	50.60	56.45	52.51
Expository Text	45.29	55.70	50.63
Mental Model	45.38	52.78	51.50
Mental Model (Narrative)	50.59	55.12	49.89
Mental Model (Expository)	43.83	54.13	49.70
Text Base	44.30	53.75	52.26
Text Base (Narrative)	51.16	57.25	53.10
Text Base (Expository)	47.10	54.95	51.65

These results have been interpreted according to the correspondence table that appears on the manual (Table 2):

Table 2

Mean scores and their Qualitative Rank

Mean scores	Qualitative Rank
70–100	High
61–69	Medium High
40–60	Medium
31–39	Medium Low
0–30	Low

As we can see, the mean of all the groups analysed was located among the medium qualitative rank and, therefore, the majority of students performed well on both texts, including the elaboration of the text base and the creation of the mental model.

## 4.2. Inferential analysis

First, we examined the degree of correlation between each variable using Pearson's *r*. As table 3 shows us, all the variables were heavily correlated with each other ( $p < 0.01$ ).

Table 3

Pearson's correlation

Variable	GC	NT	ET	MM	MMn	MMe	TB	TBn	TBe
GC	1	.798**	.798**	.926**	.731**	.683**	.921**	.706**	.704**
NT	.798**	1	.497**	.730**	.870**	.416**	.755**	.878**	.447**
ET	.805**	.497**	1	.740**	.475**	.829**	.779**	.437**	.861**
MM	.27**	.730**	.740**	1	.780**	.761**	.731**	.546**	.538**
MMn	.731**	.870**	.475**	.780**	1	.438**	.588**	.566**	.396**
MMe	.683**	.419**	.829**	.763**	.438**	1	.528**	.328**	.465**
TB	.920**	.755**	.779**	.731**	.588**	.524**	1	.765**	.796**
TBn	.706**	.878**	.434**	.546**	.566**	.328**	.765**	1	.410**
TBe	.704**	.447**	.862**	.538**	.396**	.465**	.796**	.410	1

Note. \* =  $p < .05$ , \*\* =  $p < .001$ . GC = General Comprehension, NT = Narrative Text, EP= Expository Text, MM = Mental Model, MMn = Mental Model (Narrative), MMe = Mental Model (Expository), TB = Text Base, TBn = Text Base (Narrative), TBe = Text Base (Expository)

Then, to determine whether the performance analysed on the descriptive analysis was significant and, therefore, if our sample obtained a differential performance depending on the level of representation (text base vs. mental model), a one two-way within-subjects ANOVA analysis was performed. In our case, the within-factors were text type (narrative vs. expository) and level of representation (text base vs. mental model). We performed one general ANOVA analysis with the whole sample and three different analysis depending on the grade. Results of the first analysis showed a significant effect for text type  $F(313) = 25.272$ ,  $p < .001$ , and level of

representation  $F(313) = 5.298$ ,  $p = .022$ , as well as a significant effect for text type by level of representation  $F(313) = 5.863$ ,  $p = .016$ .

Regarding the differences between grades, it can be established that there was a disparity in the significance of the effect for text type and level of representation for each one. 4<sup>th</sup> grade obtained a significant result both for text type  $F(128) = 37.205$ ,  $p < .001$ , and level of representation  $F(128) = 9.419$ ,  $p = .003$ . In 5<sup>th</sup> grade, only the text type was significant  $F(78) = 14.045$ ,  $p < .001$  (level of representation  $F(78) = .008$ ,  $p = .929$ ). While for 6<sup>th</sup> grade none of the two-way within-subjects ANOVAs were significant:  $F(105) = .207$ ,  $p = .650$  and  $F(105) = .246$ ,  $p = .600$ , respectively.

To follow up these results, we performed dependent-samples *t* tests for implicit questions on the one hand, and for explicit questions on the other. Since our aim was to analyse the differences between grades, we performed this analysis on each of the three grades. These findings show that the results were significant for the 4<sup>th</sup> grade in explicit  $t(128) = 3.962$ ,  $p < .001$  and implicit questions  $t(128) = 2.210$ ,  $p = .029$ . However, we did not find any significant correlations between explicit and implicit questions of both texts in grades 5<sup>th</sup>,  $t(77) = 1.134$ ,  $p = .260$  for explicit questions and  $t(77) = .503$ ,  $p = .616$  for implicit questions; and 6<sup>th</sup>,  $t(105) = .782$ ,  $p = .436$  for explicit questions and  $t(105) = .097$ ,  $p = .923$  for implicit questions.

## **5. CONCLUSIONS**

### **5.1. Data analysis**

The present study has analysed the influence of level of representation in reading comprehension in a sample of Spanish primary school children. As previous research found, primary school children are still developing their reading skills and, therefore, it is more difficult for them to answer questions that require them to activate their previous knowledge compared to more explicit questions (Adams et al., 1995; Bowyer-Crane & Snowling, 2005; Catts et al., 2006; Florit et al., 2011; De Mier et al., 2013; Perfetti & Stafura, 2015). As expected, our results show that students in all grades obtained higher scores on the creation of their text base compared to the mental model.

Regarding the differences between grades, we expected children from the lowest grades (4<sup>th</sup> and possible 5<sup>th</sup> grade) to obtain a stronger correlation between reading comprehension results and level of representation compared to children from higher grades (5<sup>th</sup> and 6<sup>th</sup> grades). Our results show that the scores in the reading comprehension tasks of children from the 4<sup>th</sup> grade depended significantly on the level of representation that the questions addressed (while the results of children from the 5<sup>th</sup> grade onwards are not so dependent on the type of questions asked). Therefore, these results show how in the 4<sup>th</sup> grade the mental model of the students has not developed fully yet, when compared to the creation of the simpler text base.

In fact, these results clearly show that, with expertise and time, our participants improved in the creation of their mental model and, in higher grades, they did not have more difficulties answering implicit questions than explicit ones.

## 5.2. Limitations

This study has several limitations. Firstly, although we recruited our sample from three public schools, we did not apply any kind of race, gender or socio-economic status bias, and we excluded from our sample children with disabilities. Secondly, in this study, we did not focus on the differences between narrative and expository texts. Indeed, we only focused on the creation of their text base and mental model. Finally, it should be mentioned that reading comprehension comprises many other abilities that could have an impact on the scores obtained by the sample. These issues will be explored in further investigations.

## 5.3. Implications for education

Based on the results of this research, we suggest the application of a series of measures in the classroom:

- to include from the first grades different types of reading activities and exercises, paying special attention to all types of texts;
- to teach students from an early age the strategies that will allow them to access the mental model of the texts they read;
- to recognize the type of questions that the teacher asks students and, depending on whether they are asking for more literal or inferential information, help students choose the most appropriate strategies to solve them.

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