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Fostering reading comprehension of expository texts through the activation of readers' prior knowledge and inference-making skills

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ABSTRACT

The importance of being able to critically read expository texts cannot be overstated. It is, therefore, fundamental to identify evidence-based classroom practices that can help one with this. Among higher-order skills, prior knowledge and inferences are considered the most important predictors of reading comprehension. Unfortunately, however, few reading comprehension interventions specifically address the multidimensional nature of prior knowledge and inference-making skills. In this study, an intervention designed to activate prior knowledge during reading comprehension was used to test inference-making skills and metacognition. One hundred and sixty-six secondary schools students participated in the study. Both control and experimental groups had improved reading comprehension, however the intervention based on prior knowledge activation resulted in better reading comprehension, metacognitive and inference-making processes.

The educational systems of several countries are concerned that a significant amount of students may not have the necessary literacy knowledge and skills to benefit sufficiently from their educational opportunities. Therefore, it is important to explore the reading comprehension process. In particular, students often encounter difficulties in expository texts, as their structure is more difficult to extract, they often contain specific jargon, and discuss difficult concepts as compared to narrative texts (Best, Floyd, & McNamara, 2008). In this study, an expository text reading comprehension intervention is presented that was designed to activation students' prior knowledge. Prior knowledge has been widely studied and often applied to reading comprehension, but its multi-dimensional nature has rarely been addressed. The efficacy of the intervention to activate several sub-dimensions of prior knowledge was measured.

1. Reading comprehension: Higher-order skills

Text comprehension is considered a hierarchy of skills from basic-level (or bottom-up), such as working memory and decoding, to high-level (or top-down) reading skills, such as inference-making skills and metacognition (Rapp, van den Broek, McMaster, Kendeou, & Espin, 2007). Basic and higher-order skills develop simultaneously and independently, suggesting that instruction in high-order reading comprehension should be a specific educational target, and treated independently from basic skills instruction (Rapp et al., 2007). This claim is reinforced by the consideration that certain

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students struggle in reading, even when basic skills are solid (Alvermann, Fitzgerald, & Simpson, 2006). Several studies have analyzed the influence of basic-level skills like decoding and working memory on reading comprehension, while several researchers argue for the need for more research on the influence of top-down processes on reading comprehension (Rapp et al., 2007). The research presented in this article analyzes how to maximize higher order reading skills.

1.1. Prior knowledge

Among higher-order skills, current research on reading comprehension proposes that prior knowledge is the strongest reading comprehension predictor (Alexander & Jetton, 2000; Dochy, 1994; Gurlitt & Renkl, 2010; Hailikari, Katajavuori, & Lindblom-Ylanne, 2008; Rapp et al., 2007). Prior knowledge is defined as the whole of a person's actual knowledge, available before a certain learning task, structured in schemata, declarative and procedural, partly explicit and partly tacit, and dynamic in nature (Dochy, 1994). Hailikari, Nevgi, and Lindblom-Ylänne (2007) claimed that it is important to consider what knowledge type is being evaluated. Many scholars distinguish between declarative, i.e., knowledge of facts and concepts, and procedural knowledge, i.e., know-how (Hailikari et al., 2007). Thus, prior knowledge is a multidimensional and hierarchical construct in breadth, depth, and quality (Alexander & Jetton, 2000). Prior knowledge has been assessed in several studies, but generally through multiple-choice questionnaires inquiring what readers knew about a certain topic. However, not all prior knowledge types have similar relevance in relation to students' achievement. For instance, some scholars distinguished between domain and topic knowledge (Alexander & Jetton, 2000; Dochy, 1994; Tarchi, 2010, 2012). Domain knowledge represents what a student knows about a certain discipline, e.g., history, science, geography. In other words, domain knowledge is the breadth of knowledge within a field (Alexander & Jetton, 2000). Instead, topic knowledge is a more focused knowledge on a specific topic, e.g., The French Revolution, the digestive system, the geography of a specific country. Topic knowledge, therefore, represents the depth of knowledge in a certain topic (Alexander & Jetton, 2000). Topic knowledge can be further differentiated from knowledge of facts. Knowledge of facts is a lower level of declarative knowledge that can be assessed by simply asking the student to enumerate essential concepts on a certain topic, and knowledge of meanings, i.e., a higher level of declarative knowledge that requires the student to understand the meaning of a specific concept and correctly define it (Hailikari et al., 2007). Previous studies confirmed that these dimensions of prior knowledge contribute differently to reading comprehension performances such that topic knowledge of facts and meanings influenced reading comprehension more than domain knowledge did (Tarchi, 2010, 2012).

1.2. Inference-making skills

Inference-making is another higher-order skill that has a central role in reading comprehension (Rapp et al., 2007). When readers are required to integrate information provided by the text but located in different sentences, or when they need to incorporate information outside the text, they need to make an inference. The contribution of inferences to reading comprehension is independent from prior knowledge, however these two components work in synergy to fill the gaps found in the information of the text (Best, Rowe, Ozuru, & McNamara, 2005; Cromley & Azevedo, 2007; Tarchi, 2010, 2012). Inferences are what make the reader move from a mere interpretation of individual sentences to a global meaning that integrates multiple sentences (Best et al., 2005). Oakhill (1983) pointed out that poor comprehenders have difficulties in dealing with constructive inferences (that is, creating links within the text) as well as understanding the meaning of a word based on context. While addressing the relevance of these two inference types for reading comprehension, Tressoldi and Zamperlin (2007) proposed a distinction between lexical and semantic inferences. In order to activate the correct and more appropriate meaning, it is necessary to make a lexical inference, to adapt one of the possible meanings of a term within a sentence. A semantic inference, in contrast, is based on a wider knowledge of the world. In this study, both inference types were assessed to determine the specific efficacy of the intervention (see Section 3 for more details).

Cromley and Azevedo (2007) tested the combined effect of prior knowledge and inferences on the reading comprehension process in their direct and inferential mediation model of reading comprehension. They found that the reader's prior knowledge and his/her word reading have both a direct and indirect influence on reading comprehension. Via the indirect path, the effect of prior knowledge is mediated by metacognition and inference-making skills. Tarchi (2010) refined this model by including the multidimensional nature of prior knowledge higher-order skill that both the direct and indirect prior knowledge effects on text comprehension depended on the subject-area and the text content. In this article, the reader's prior knowledge of key concept meanings was hypothesized to directly and indirectly influence the comprehension of a science text, while prior knowledge of facts was hypothesized to directly and indirectly influence comprehension of a history text with both being mediated by inferences.

Prior research has confirmed the importance of addressing the multidimensional nature of prior knowledge and its interaction with inference-making skills in designing interventions that foster students' reading comprehension processes. Prior knowledge and inference-making skills have often been treated in isolation. Several authors have included prior knowledge in their reading comprehension interventions (Taboada & Guthrie, 2006). Indeed, some authors have created activities to facilitate the retrieval of relevant knowledge for comprehending a text (Rapp & Kendeou, 2007) or question-and-answer generation tasks (Darch & Gersten, 1986). Palincsar and Brown's (1984) Reciprocal Teaching had students ask relevant questions of the text, which theoretically activates inferences, and predict the content of the following paragraph (prior knowledge activation). Pressley et al.'s (1994) Students Achieving Independent Learning program also activated