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Text-Based Inference Instruction for Elementary Grade Children with Reading Comprehension Difficulties: An Intervention Research

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ABSTRACT. The current study investigated the effects of inference instruction on text-based inferences by third graders who are below average in reading comprehension but average in reading fluency and cognitive abilities. Text-based inferences occur when the preceding text has an identifiable causal antecedent. Participants were randomly assigned and attended twelve 30-minute sessions of the inferences training intervention. We have included strategies for integrating information from the text to improve reading comprehension skills. We provide an overview of how specific text-based instruction influences reading comprehension processes and outcomes and can lead to increased reading comprehension. The comparison of pretest and posttest results in the experimental group showed a significant gain in the following variables: generating inferences and providing arguments for using rules and constraints. Finally, we discuss how consideration of these potential sources of instruction has practical implications for designing and selecting instructional materials.

Key-words: reading comprehension, text-based inferences, reading comprehension instruction, inferences, inference instruction, reading comprehension difficulties

INTRODUCTION

Language comprehension requires the skills to create coherent mental representations, such as formulating concepts. These conceptual representations or mental models include textual content and background knowledge about

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semantic relations (e.g., causal relations) (Cervetti & Wright, 2020; Kintsch, 2018; McCrudden & Schraw, 2010). The reader can identify such semantic relationships through inference generation (Perfetti, Rouet, & Britt, 1999; van den Broek et al., 2005). The capacity for inference generation plays a pivotal role in the development of coherence in comprehension. By making connections between explicit information and drawing upon background knowledge, readers fill in gaps in the text, constructing a cohesive understanding that transcends the literal meaning of the words on the page (Smith, Snow, Serry, & Hammond, 2021). This skill is fundamental in facilitating the development of coherent representations during the comprehension of written material. A study conducted by Oakhill, Hartt, & Samols, 2005) underscored the significance of inference production in comprehension. They observed that proficient young readers demonstrated a propensity to integrate the meaning of sequences of sentences consistently, reflecting their adeptness in generating inferences to establish coherence in comprehension. Thus, producing inferences is a crucial skill that enables coherent representations during reading comprehension. In a study reported by Cain & Oakhill (1999), good young readers' comprehension was written to integrate the meaning of sequences of sentences consistently. In contrast, poor comprehenders were less likely to do so. In a study involving 7- and 8-year-old readers, the authors demonstrated that poor comprehenders made more inferences than a younger group with matching comprehension ages, as the groups were equated based on their knowledge of meaning. These differences between groups of the understanding generation were not dependent on comprehension ability but rather something that preceded comprehension gains (Rubman & Waters, 2000; Spooren & Sanders, 2008). Children who are weak in making inferences almost inevitably fail to comprehend all but the most straightforward texts because they need help identifying meaningful connections that lend coherence to their text representations. Such weakness may result in difficulty recognizing the proper referential links that indicate that an object or person referred to in one sentence is identical to another (Long, Oppy, & Seely, 1994; Oakhil & Cain, 2012; Oakhill, Hartt, & Samols, 2005; Rouet, Britt, & Durik, 2017). Inference difficulties also manifest in problems making inferences that fill conceptual gaps between the text's clauses, sentences, and paragraphs (Magliano, Wiemer-Hastings, & McNamara, 2002; Oakhill, Yuill, & Donaldson,1990). Even if a reader can make such inferences, weaknesses may arise if they adopt standards of coherence that do not align with the goal of reading the text, leading to insufficient or inadequate inferences (Lehmann, Rott & Schmidt-Borcherding, 2019; van den Broek, Bohn-Gettler, Kendeou, Carlson, & White, 2011). Finally, weakness in inferential ability may result when the reader needs more background knowledge necessary for meaningful inferences (Cook, Limber, & O'Brien, 2001). This background knowledge includes both content knowledge (e.g., when a ball hits a glass, the glass is likely to break) and knowledge about text structures (e.g., narratives usually begin with a setting and problem and end with some resolution; different types of informational texts have other formats (Duke (2004). Readers who struggle to infer meaningful connections, apply appropriate standards of coherence, or lack background knowledge are likely to form inadequate representations of the texts they read, leading to a failure to understand their meaning.

Several types of inferences can be generated because readers can track events along a variety of text dimensions, and readers can rely on various sources of input (i.e., the current text, the previous text, and prior knowledge) to build causal relations in a text (Bohn-Gettler et al., 2011). Nonetheless, conclusions can be divided into two categories: text-based and knowledge-based (Marianne, van Moort, Koornneef & van den Broek, 2018). Text-based inferences are links readers make to specific ideas offered earlier in a text. Such conclusions can connect to information from the text immediately preceding it (i.e., near text information; local coherence) or earlier text sections (i.e., distant text information; global coherence). Knowledge-based inferences are links readers make to underlying knowledge (i.e., global coherence) that can be explanatory, associative, and predictive. When compared to the text, these inferences can also be merged with related or unrelated prior knowledge (Carlson et al., 2014; McNamara & Magliano, 2009; Rapp, van den Broek, McMaster, Kendeou, & Espin, 2007).

Next, our study will focus on text-based inferences. However, we identify two opposed positions relative to the prerequisites to induce text-based inferences. The first position accredits the idea that the ability to selectively update some knowledge from the text (premises), from whose combination an inference may result, is the guarantee of initiating the inferential process. The second position postulates that although poor readers update linguistic inputs necessary to generate inferences, they still need help relating these inputs (Oakhill, 1994). The cause of these difficulties is that generating an inference involves more than simply activating and associating two pieces of information. It is a combination operation and involves the idea of a qualitative leap. We aim to test the extent to which some competencies of text-based inference generation can be improved. The strategy we will employ will focus on the feedback technique.

Some general principles synthesized from the literature are relative to providing feedback (Weaver, 1994). It is recommended as follows: (a) Providing feedback immediately after a student gives the correct answer; this feedback should emphasize the simple correctness of the answer (Harvey, Stephanie & Goudvis, 2000). (b) Providing feedback after an incorrect answer should be immediate; underline the correct answer and argue why the latter answer is the correct one. If a task aims to understand how a specific rule works (such as learning a notion based on discrimination against examples of counterexamples), feedback should illustrate the functionality of that rule based on examples/ counterexamples.

Starting from the studies of Bassiri (2007) and Kucan & Beck (1997), we designed an instructional procedure that uses explicit feedback on constructing text-based inferences. Through this procedure, we highlight (a) the role of explanatory feedback in developing the skills to generate deductions and (b) the extent to which these skills can be transferred in the processing of other materials.

The main objective of the present study is to transfer the potential of the following aspects:

(1) Ways of identifying premises and constraints in a passage.
(2) Procedures for setting up chunks based on the combination of premise and constraint. Both elements must be simultaneously activated in working memory for the subject to provide relevant answers to inferential questions; procedural knowledge is required to generate inferences independently of the passage's content.

Carnine et al. (1982) instructed students to read passages containing two specific categories of information. The two types of information were components of an inference. Thus, the first piece of information provides the basic framework for a probable event to occur, and we call it the rule. A rule describes either (a) a goal that one of the characters in a narrative is trying to achieve or (b) a general process that proceeds with some regularity. The rule in this latter sense corresponds to what he calls Kintsch's (1998) strategy or algorithm. The second type of information is constraint and aims at the contextual application of the rule, more precisely circumscribing the limits within which the rule can be applied. The inference resulting from combining the two premises is an approximate judgment. The events contained in this judgment occur with a certain probability. This inference is an extension of the facts of everyday life. Following this principle, we have formulated several passages. For instance, one of the stimulus passages used in the experiment was as follows:

> *"Once upon a time, there was a boy named George who adored music. Even though his family didn't have much money, George did really well in school. One sunny day, a mysterious uncle George had never met before came to visit. George felt a mix of excitement and nervousness as he watched this new uncle. As the day turned into evening, George's uncle surprised him with a fun idea. With a kind sparkle in his eye, he said he wanted to give George a special gift. Then, he pulled out two presents: a shiny smartphone and a beautiful guitar. George's heart raced as he looked from the phone to the guitar and back again. Both were tempting in their own way. The phone offered limitless possibilities and adventures with just a touch. Now, George had a tough choice to make. Which one do you think he picked?"*

In the realm of semiotics, it becomes apparent that most everyday occurrences unfold with varying degrees of likelihood. Rarely does one event (A) unequivocally lead to another (B) without any intervening factors. There are two abstract models for comprehending sequences of events. The dyadic model illustrates A directly causing B without mediation, such as when striking someone's leg with a hammer prompts a reflexive movement. However, consider requesting someone to move their leg; their response becomes uncertain, suggesting numerous intermediate steps between A and B. This triadic model introduces a space of options (C) and uncertainty between A and B, contrasting with the definitive determination in the absence of such a space. Human actions often conform to this triadic pattern. Drawing from various experiences (e.g., observing that a dropped vase usually breaks, albeit with mitigating factors like a sponge), we formulate rules and seek explanations to clarify communication events. By applying a rule ("George adores music") and its constraints ("Deciding between two options while knowing that having both is not possible"), one might hypothesize, as in the example given, that "George decided to pick the guitar as his gift," opting for this interpretation. The most plausible inference arises from the alignment of the rule (intentionality) with coercion: "George made the choice to select the guitar as his gift instead of the smartphone." This conclusion is subject to debate, but it encapsulates the event with the highest likelihood of occurrence. Given a rule and constraint, inducing a bridge inference (by answering the question "Which one do you think he picked?") necessitates three conditions to be fulfilled: First, subjects must recall from the passage the information typically represented; Secondly, the students must update the information corresponding to the constraint, i.e., the condition that allows the application of the rule; Finally, students must form two independent chunks of information and maintain them activated simultaneously in the text's long-term working memory (Kintsch, 1998). The two chunks form the input of a cognitive procedure called text-based inference, resulting from combining rule and coercion. The third condition concerns procedural knowledge. This procedural knowledge in the form of rules is the processing of information carried out by an adult, usually in an automated way. In contrast, we hypothesize that this procedural knowledge only works sometimes in children, especially those with a deficit understanding. Logically, all three conditions – access to both terms and application of the procedure, which transforms the two inputs, are necessary and sufficient conditions for constructing plausible text-based inference. Finally, the study aims to provide detailed explanatory feedback on the terms of an inference (rule + constraint) on generating bridge inferences in students with comprehension difficulties. Based on the provided text, here are two objectives formulated:

Objective 1: To investigate the effectiveness of providing detailed explanatory feedback on the components of an inference (rule + constraint) in enhancing the ability of students with comprehension difficulties to generate bridge inferences.

Objective 2: To explore how the triadic model of event sequencing in semiotics (where A causes B with intervening factors C) applies to the comprehension of narrative texts among students, particularly in scenarios requiring the inference of choices based on contextual clues and constraints.

These objectives aim to concentrate the study on improving inference generation and understanding the cognitive processes involved in interpreting narratives with varying levels of certainty and likelihood.

Hypothesis: The study hypothesizes that offering comprehensive explanatory feedback on the components of an inference (rule + constraint) will significantly enhance the ability of students with comprehension difficulties to generate bridge inferences.

METHOD

Participants

In this study, 36 participants were involved, comprising 19 males and 17 females aged between nine and ten years old, all from grade three. These students were selected from various schools in Cluj-Napoca based on their classification as less proficient comprehenders, determined by their performance on The Reading Comprehension Test (TECC) (Mih, 2004). The TECC is a standardized assessment tool designed to measure reading comprehension levels among students in grades 2 to 5. The test's standardization was conducted by considering the following inferences: (a) Connection inferences aim to deduce and establish simple cause-and-effect relationships. (b) Anaphoric inferences entail integrating information from the text to infer pronominal or anaphoric relationships. For instance, this involves linking the pronoun "together" to the verb "entered" occurring two sentences later, thereby arriving at the correct answer. (c) Elaboration inferences describe combining information from the text with the child's general knowledge, appropriately selected from their knowledge base and personal experience, capturing the topographical representation of relationships derived from constructing the spatial model of narration. (d) Predictive inferences aim to formulate predictions based on textual data. (e) Factual information operationalizes the accurate selection of information from the text to answer factual questions. The test comprises eight stories, each progressively increasing in difficulty level. The narratives are categorized into four levels of difficulty: A, B, C, D; each level further divided into two sub-levels, 1 and 2. Each story is printed on a single page, followed by 4, 8, and for the highest level, 11 comprehension questions. One point is awarded for each correct answer. The maximum possible score achievable by participants is the sum of points awarded for all items. The total raw score amounts to 64. The internal consistency coefficient value calculated for the comprehension test, α Cronbach, is 0.78. This coefficient falls within the typical range of coefficients obtained in practice (between 0.70 and 0.98). The students selected in the experiment group were in the bottom three normalized classes of TECC. Half of the students were integrated into the experimental group, and the other half into the control group. The two groups of children were equivalent in cognitive abilities, vocabulary, and verbal fluency. We did not include children diagnosed with dyslexia or attention deficit hyperactivity disorder, as reported by parents or teachers. Only children whose parents gave written informed consent were allowed to participate. The children were tested in schools during school hours.

Instruments

Cognitive abilities. Raven's Standard Progressive Matrices (Raven SPM) (Raven, 1981) were used to measure children's nonverbal reasoning ability. There were five sets administered, with 12 items per set. Each item consisted of a target matrix with one missing part. Children were asked to select the item that best fits the matrix among six to eight choices, with a maximum score of 60. The dependent variable was the number of correct items given in the 30 minutes children were allowed to spend on the task.

Vocabulary. The Peabody Picture Vocabulary Test (PPVT) (Schlichting, 2005) was altered to enable group-administered testing. Instead of picking out the correct answer, children were asked to circle the correct answer on an answer sheet. This test was used as an indicator of receptive vocabulary. A participant's score was the number of items they answered correctly within 15 minutes. The PPVT consisted of 60 items with progressively increasing difficulty. In addition, a vocabulary test was administered as part of the individual test. His 20-point test required children to match words and meanings. A participant's score was the number of items they answered correctly within 3 minutes.

Reading Fluency. The children were given a Curriculum-Based Measurement (CBM) task to assess oral reading fluency (Deno, 1985). In this task, children read aloud a text for one minute. The participant's scores were the number of words children read correctly minus the number of words children read incorrectly in one minute.

Materials. 10 passages of approximately 150 words were written and structured according to a method proposed by Carnine et al. (2004) and Carnine et al. (1982). Each passage contained (a) a problem, (b) a rule that required a solution to the problem, (c) a constraint that matched the rule to how to solve the problem, (d) distracting information that could solve the problem, and (e) irrelevant information. The instruments for the pretest and post-test phases consisted of six passages (three for each phase). The remaining four passages were used during the training sessions. Five questions were written, corresponding to each passage. The first question required the student to generate an inference based on the text, being structured in two parts: the first part concerned the actual deduction (*"Which one do you think George picked?"*); the second part required the student to justify the deduction (Why?). The answer to this last question requires reactivating both rule and coercion. It is important to emphasize that the two information chunks do not prime each other; in other words, no information (explicit element of text coherence) present in the inferential question facilitates recall of rule or constraint. The answer to the question "Why?" is a necessary clue to ensure the extent to which the learner can update and associate the knowledge in the text necessary for the inferential process.

Procedure

Two groups of students participated in the experiment: an experimental one, subjected to a training phase to learn to generate text-based inferences, and a control phase. Initially, the two groups of students were equivalent, relative to (a) cognitive abilities ($t(34) = 1.13$, $p = .96$), (b) vocabulary ($t(34) = 1.27$, $p = .21$), and (c) reading fluency ($t\ (34) = .78$, $p = .43$), indicating insignificant differences between groups. All students underwent a pretraining phase beforehand. To determine the initial performance level of the two groups, immediately after the pretraining phase, both groups were given a pretest. The pretest consisted of three passages and three sets of six questions each. Immediately after reading the passages, the subjects would answer those questions.

In the training phase, the students of the experimental group were trained during twelve sessions by a group of three tutors (second-year undergraduate students) (each tutor being assigned a group of four students). To reduce variability in the instructional procedures implemented by the three tutors during the training sessions, a standardized protocol was developed, outlining the primary sequences of the training phase. In addition, the tutors were provided with a second protocol, containing (a) the question items to be addressed to the students and (b) the answers related to these questions.

Finally, students underwent a post-test that mirrored the pretest (essentially a parallel version) to assess the transfer of procedural knowledge. The data collected from both protocols (pretest and post-test) underwent statistical analysis.

The pretraining phase was designed to avoid possible discrepancies between groups and implicitly to level the differences between subjects relative to the understanding of the task. The role of this phase was to familiarize the students with the task's requirements, i.e., to make the task transparent in the student's terms. To this end, we have developed two passages similar to those used in the pretest and post-test phases. During this phase, the tutor went through several steps with the student. Thus, the tutor initially read each passage aloud to prevent decoding issues and significant processing difficulties. Meanwhile, the student followed each word/line of the text read on a copy of the passage he had previously received. Immediately, the tutor (a) read the first item, i.e., the inferential question, (b) repeated the inferential question, (c) repeated the student's answer, (d) asked the student to underline the phrases in the passage on which he bases his answer. Given that students aged 9-10 years do not yet have a well-structured capacity for argumentation (and even more so those with difficulties of understanding) based on which they can provide well-founded answers to the question "Why?", we consider that the indication of the two expressions indirectly argues the answer to the questions concerned. We also postulate that the correct emphasis by the student on the two expressions denotes his ability to implicitly recognize the rule and constraint on the basis of which the inference is elaborated.

Control group. In the pretraining phase, in the control group, after the child emphasized the answer, the tutor repeated the inferential question and indicated the correct answer. There were two situations. Given that the student's oral answer to the deductive question was correct (i.e., the inference was formulated based on a paraphrase of rule and coercion), the tutor thanked the student for listening carefully to the text and emphasizing the answers. If the student's answer was incomplete or incorrect, the tutor indicated the correct answer. In both cases, the tutor used a coloured pencil to emphasize the student's copy of the information given by the rule and the critical fact.

Training group. Compared to the students in the control group, the students in the experimental group were given feedback based on repeated explanations (Duffy et al., 1987). Thus, as a general principle, the tutor explained and demonstrated to the students, on the one hand, how the rule can be applied and, on the other hand, how coercion can be used to generate a correct deduction based on the information of the text. This process involved (a) the learner's awareness of the issue raised by the passage, as well as (b) indicating and underlining the rule and constraint (the tutor indicating the two components again, even if the learner made the correct choice) during reading aloud. It also discussed why it was considered a constraint about the problem posed and circled every expression in the text (Table 1).

Table 1. The synthesis of variables within the experiment and their operationalization

Variable	Operationalization
Inference	Inference refers to the process of deriving conclusions or making deductions based on evidence and reasoning rather than explicit information.
Update the rule	Updating the rule involves revising or modifying the existing knowledge or principle used to interpret or make sense of new information or situations.
Update constraint	Updating the constraint entails adjusting or refining the limitations or conditions that influence decision-making or interpretation in a context.
Reasons for the rule	Reasons for the rule are the justifications or rationale behind the principles or guidelines used to interpret information or make decisions.
Reasons for coercion	Reasons for coercion refer to the motivations or explanations for compelling or influencing someone to take specific actions or make certain decisions.

Describing and exemplifying how to corroborate the rule with coercion, during the explanations, the tutor circled the expressions corresponding to the rule and those corresponding to the constraint and joined them with a line. The explanation ended with an explicit description of how to infer from this information. The tutor demonstrated how to confirm a rule alongside a constraint by circling corresponding expressions and linking them. This process was followed by a clear explanation on deducing conclusions from this information. Subsequently, the tutor elucidated five other literal comprehension questions, emphasizing the significance of both distracting and irrelevant details in influencing deductions. Towards the end, there was a repetition of essential information aimed at prompting deductions, accompanied by explicit instructions on the deduction process. This instructional approach, akin to the one outlined by Winograd & Hare (1988), encompasses defining, justifying, demonstrating, and situating the strategy.

RESULTS

The results are presented in Table 2 and Table 3, which summarise the means and standard deviations corresponding to the different types of variables evaluated for the experimental and control groups in the pretest and post-test phases. As shown by statistical data processing, the pretest showed no significant differences in the number of generated inferences between the two categories of subjects (control group vs experimental) (t(34) = .89, p=ns). As such, we are entitled to consider that from the start, the two groups of subjects were equivalent in inferential capacity. There were also no significant effects in the control group between the pretest-post-test phases for any of the variables considered (Table 2).

Table 2. Differences between pretest and post-test in Control Group

Variable		Pretest	Post test	t	p	df
Inference	M	1.12	1.32	.38	.70	34
	σ	.33	.41			
Update the rule	M	.81	.68	.31	.75	34
	σ	.27	.31			
Update constraint	M	.43	.48	.12	.90	34
	σ	.25	.33			
Reasons for the rule	M	.60	.47	.39	.69	34
	σ	.27	.19			
Reasons for coercion	M	.44	.35	.23	.81	34
	σ	.26	.19			

Table 3. Differences between pretest and post-test in Experimental Group

Variable		Pretest	Post test	t	p	df	d
Inference	M	1,07	1,85	2.10	.04	34	2.97
	σ	.32	.27				
Update the rule	M	.76	.93	.38	.70	34	.53
	σ	.30	.33				
Update constraint	M	.40	.54	.43	.66	34	.71
	σ	.24	.22				
Reasons for the rule	M	.53	1.26	2.03	.05	34	5.60
	σ	.18	.24				
Reasons for coercion	M	.39	1.08	2.34	.02	34	3.31
	σ	.17	.24				

Given that the hypothesis requires evaluating the impact of training on the two groups of subjects, we analysed performance differences in the post-test for the following variables: inferences, motivation of inferences, updating rule, and constraint (Table 3). Comparison of pretest and post-test results in the experimental group showed significant profit on the following variables: inferences ($t(34) = 2.10$, $p < .05$, $d=2.97$) and motivation of rule ($t(34) = 2.03$, $p < .05$, $d=3.50$) and constraint ($t(34) = 2.34$, $p < .02$, $d=3.31$). These data confirm partially the hypothesis.

It is important to note that no significant differences were revealed between the pretest and post-test between rule and constraint updating performance in the two groups of students.

We propose for discussion - starting from the experimental data obtained - the two theoretical positions presented in the introductory part regarding the induction of deductions. (1) The first position holds that the mere selective updating of the text's information to constitute an inference guarantees the actual elaboration of that inference. (2) In contrast, the second position states that, although less skilled comprehenders update the inputs necessary to start the inferential process, they resist combining those inputs to derive an inference.

Given a rule and constraint, inducing an inference based on text information (by answering the question, " *Which one do you think George picked?*") involves three steps. First, subjects must recall the information usually represented from the passage. Secondly, children must update the information corresponding to the constraint, i.e., the condition that makes it possible to apply the rule. Finally, it is necessary to create two independent chunks of information, which must be simultaneously kept activated in long-term working memory. The two chunks form the input of a cognitive procedure called text-based inference. This inference results from combining the rule with the constraint.

The third condition concerns the acquisition of procedural knowledge. Procedural knowledge is presented as rules/procedures and represents information processing that readers perform automatically. In contrast, we postulate that these procedures need to be revised in children, especially children with a deficit of understanding. Logically, all three conditions – access to both terms and application of the procedure, which transforms the two inputs, are necessary and sufficient prerequisites for constructing a plausible inference based on the content of the text. Based on this flow of argumentation, we can infer a specific resistance shown by less skilled comprehenders in joining the two pieces of information and their simultaneous compatibility.

Three factors can be identified as potentially responsible for the presence of lower inferential performance of the control group students in the post-test: inefficient access to information corresponding to the rule; ineffective access to coercion.

The procedure's inefficient functioning depends on which of the rules' content is accessed and combined with that of coercion. One of the causes of the difficulty of inducing inferences in students is that ordinary classroom instructions do not require the generation of such inferences. Lessons with weak students mainly focus on regular reading skills and word recognition. Thus, the temporary resources allocated to comprehension instructions are minimal (Kos, 1991), and an even smaller share is allocated to the inferential process based on the contents of the text. In conclusion, the study attests to and reinforces that students who participate in explicit instructions for learning inferences understand the task's demands much faster and implicitly understand the meaning of the text.

CONCLUSIONS

Our research has shown that directly teaching reading strategies can improve students' reading comprehension. Meanwhile, this study was designed to deliver an intervention that included the direct teaching of 5 of the most widely researched reading comprehension strategies. The techniques used in previous strategy teaching approaches, such as modeling, scaffolding, and cooperative learning, were included.

The study attests and reinforces that students who participate in explicit instructions for learning inferences understand the task's demands much faster and implicitly understand the meaning of the text. One issue for the current study is that the training during the causal questioning activity may have been limited in encouraging readers to generate knowledge-based inferences. The questions were developed to help readers make causal connections in the text. To make these causal connections, readers draw on memory from previous texts (e.g., character goals, events, causality). This questioning activity may have been more text-based than knowledge-based, resulting in fewer knowledge-based than text-based inferences generated when answering the questions. However, readers can still utilize background knowledge to understand the text, and how they do so, beyond the encouragement of causal text-based questions, might provide vital information for understanding additional processes that can help or hinder comprehension. Future research developing additional questioning tasks based on text and knowledge could provide further insight into individual processing differences during reading.

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