

Primary School Inference Making Strategies: From Research to Practice

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Abstract

Inferences reflect a student's ability to use background knowledge, values, and beliefs combined with evidence and logical reasoning. Research shows that students with higher levels of inferencing skills score higher on tests of reading comprehension than do students with lower levels of inferencing skills. This is true for both primary school age students [1] and adolescent readers [2]. Students require instruction in making inferences to analyze various types of text [3]. Using explicit methods to foster inferential thinking and reading comprehension results in improved reading comprehension [4]. Instructional practices that engage primary school students to seek and use cues to make inferences using objects, pictures, words, simple sentences, and text passages appear to produce positive reading outcomes [5].

1. Introduction

Students at the primary school level learn foundational reading and writing skills that are necessary for advancing through school. An essential prerequisite for the study and analysis of complex subjects and topics is the ability of students to make inferences. The ability of students to think inferentially is correlated with higher scores on tests of reading comprehension both at the primary [1] and secondary levels [2].

In light of this research, teaching students the skills and cues needed to make inferences leads to improved reading comprehension and is an essential component of primary level instruction. This article provides educators with research-based, explicit strategies to foster inferential thinking of students in primary level programs. The strategies are designed for students who are still mastering foundational reading and writing skills.

2. Literature Review

Converging research supports the explicit teaching of inference making with students at the primary school level. Studies have shown that even preschool children are able to learn to make inferences [6]. Studies demonstrate that young children are able to learn the cues and skills to make inferences by beginning with oral narratives. By

posing strategic questions, teachers may assist students in connecting meaningful events and infer future causal events in a story [6]. In addition, emerging readers may be taught inference making skills with the use of objects, pictures, and videos well before they attain proficient reading skills [5]. Students are then able to develop inferential thinking skills while learning basic decoding skills for reading.

Studies corroborate the view that young students benefit from the direct teaching of inference making skills [4]. These skills include the following: clarification using text clues; activating and using prior knowledge; understanding character perspectives and author's purpose for narrative text; answering inferential questions [7].

An essential aspect of making inferences is how one organizes background knowledge when engaged with new observations and information. This mental representation of knowledge is sometimes referred to as "schema" [8]. Children in primary school are continually refining their schema as they learn new content. Exposure to a wide variety of narrative and expository text may broaden the background knowledge of students and refine their schema of many concepts [9]. In addition, teacher-posed questions that encourage students to evaluate new information in relationship to their current schema promotes inference making based upon evidence and reasoning especially when students are asked to explain their thinking [9].

A prerequisite that supports primary school students in making inferences is their vocabulary knowledge. Research indicates that vocabulary knowledge supports the ability of students to make text-based inferences at the sentence and passage levels [10]. Students learn vocabulary both explicitly and implicitly. Educators can increase the vocabulary knowledge of their students through interactive and contextual strategies that cross multiple domains of study [11]. Teaching students to understand the literal and figurative meaning of words, multiple meanings, and word associations are all aspects of explicit vocabulary instruction. By translating current peer-reviewed research into instructional practices, educators can cultivate inference making skills with students at the primary school level. Teachers begin by using concrete objects and gradually transition to pictures, words, sentences,

paragraphs, and text to help students develop these skills.

3. Classroom Strategies – Object/Picture Level

Teachers may use objects and pictures to foster inferential thinking skills during the prereading phase of reading development. Language frames may be used to support the use of academic vocabulary and discussion. Using objects is an effective method to teach young students to use their observations and background knowledge to make inferences. One type of activity to use with primary level students is to display unusual objects [12]. Have students examine the object by viewing and touching the object. Prompt students to determine the function of the object by asking a series of questions to elicit inferential thinking. The following teacher-posed questions and protocol may assist students in using observational skills and background knowledge to develop an inference.

- a. What do you notice about the object by looking at it and holding it? The teacher may record and display answers for the students or review student responses orally with the class.
- b. Does the object remind you of anything?
- c. How might the object be used?
- d. What clues or information did you use to infer the function of the object?
- e. Do you want to change your answer based upon new information shared by your classmates?
- f. The teacher then verifies the actual function of the object and points out the clues and information that support the correct answer.

Students who are learning to read may engage in inferential thinking lessons through the use of pictures. The use of pictures and video clips enables teachers to use relevant, grade-level content while fostering higher level thinking skills with their students. Visuals do not penalize students who are still learning to read or who have difficulties in mastering reading skills. Students view a picture or video clip while a teacher poses strategic questions. For example, teachers might ask students to share what they notice in the picture. After students share their observations, the teacher could ask the following questions: What might be happening in the picture? How are the people feeling in the picture? What is the message that you get from the picture? An alternate approach is to cover a portion of a picture or play a video clip and pause it at a specific point in the clip. Students are then asked to infer what might be covered in the picture or what might happen next in the video clip. Emerging readers have the opportunity to use observable evidence to activate inferential thinking skills. A proposed chart may be used to record the thinking process of students. The teacher records students' answers,

evidence, and reasons that support their responses. This type of chart provides a visual organizer to map out the thinking of students.

Making Inferences

Name: _____ Date: _____

Your Guess	Clues/Evidence	Reasons?

Figure 1. Student inference chart

4. Word Level Inference Strategies

Vocabulary knowledge is a key component of both listening and reading comprehension. It is also a strong predictor of students' abilities to make inferences in both spoken and written language [11]. Therefore, vocabulary instruction should be an integral part of a primary level reading program. Vocabulary knowledge is more than learning the meaning of a word. Instruction should include the understanding and use of synonyms in text, identifying pronouns and their referents, denotation and connotation usage by the author, teaching multiple meanings of words, and making semantic associations with related terms. The following strategies are effective in developing the vocabulary and inferencing skills of students. These may be used through listening or reading activities.

- a. Have students underline synonyms used by the author of a narrative or informational piece to refer back to the main topic of the passage. For example, the author of a passage about sharks might use synonyms such as predator or carnivore to refer to the shark. Identifying these synonyms is best accomplished by having students read or listen to the passage, sentence by sentence.
- b. Analyzing captions or simple sentences is an excellent approach to helping students understand denotation or the literal meaning of a term versus connotation which is the underlying meaning of a word or phrase in a caption. For example, students can compare and contrast 2 sentences for denotation and connotation.
 - I bought inexpensive gifts for the family (denotation).
 - I bought cheap gifts for the family (connotation).

The literal meaning of the term “inexpensive” in the first sentence refers to the gifts being low-

priced. It is a neutral term that does not necessarily evoke a positive or negative feeling for the reader. In the second sentence, the use of the term “cheap” connotes the attribute that the gifts are of low-quality. The underlying meaning of “cheap” evokes a negative feeling about the quality of the gifts.

- c. Teaching the multiple meanings of words deepens the ability of students to infer implicit meanings or messages in text through visual or context clues. One method uses pictures and labels to show that certain words convey different meanings. Teachers use word cards to display a word with a picture or drawing that depicts its meaning. For instance, the word “match” is displayed with a picture of an individual lighting a candle with a match. A second word card is displayed that shows a pair of socks that are the same color and size with a caption that reads “the socks match.” A second method for teaching multiple meaning words requires that students use context clues to determine the meaning of a targeted word in the sentence. The teacher directs students to underline parts of the sentence that are clues for determining the meaning of the bolded word. Students select the correct meaning from a list of possible answers.

The bat <u>slept</u> in the shed <u>all day</u> and <u>awakened</u> at <u>night</u> to hunt for food.
A bat is:
a) a solid stick used to hit a ball in baseball
b) a flying mammal that sleeps in the day and is active at night
c) to strike or hit

Figure 2. Multiple meaning and context clue hunt

- d. Vocabulary development is supported by creating semantic associations. Teachers can employ sorting and classifying activities to help students understand how words are related. For example, a teacher can ask students to list all the words that are associated with a topic word using a visual organizer or mind map.

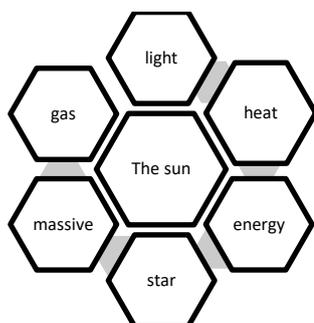


Figure 3. Semantic association map

- e. A second strategy to build semantic associations is to simply ask questions that require students to compare and contrast new vocabulary with other words or ideas. A teacher might ask students how a character in one story is similar to a character in a different story. Alternatively, teachers could display an object or picture and ask how the attributes of the concrete display are similar to concept vocabulary. For example, the layers of an apple might remind students of the layers of the earth with a thin crust, a thicker mantle, and a core. The teaching of vocabulary through an interactive and generative approach enhances the skills necessary to make inferences at the word level [13].

5. Sentence Level Inference Strategies

Inference strategies can be expanded to have students read and analyze simple written statements. An instructional strategy to engage students in inferential thinking is to have students read a sentence that states an observation. For example, the teacher can display a statement, such as “A road has a big puddle of water.” After students read the statement, the teacher might ask the following questions:

- a. What could have caused the puddle to form?
- b. Why do you think that?
- c. How do you know?

It is essential that teachers present statements that contain familiar vocabulary and tap into the background knowledge of their students.

Anaphoric and cataphoric inferences are essential to reading comprehension as students learn to read multiple sentences on a topic. Readers must be able to identify pronouns and their referents to gain meaning from related sentences. In addition, writing to a topic requires the correct use of pronouns and their referents to maintain cohesion in the written piece. Many students at the primary level need direct instruction on how pronouns refer back to their content words.

An inference strategy that supports sentence and text reading comprehension is called anaphoric and cataphoric cueing [14]. When students read sentences, they are required to make causal connections. An anaphoric inference means a word in a text refers back to other ideas in the text for its meaning. A cataphoric inference means a word refers to ideas later in the text. The following table illustrates an instructional method that may assist students in identifying the cues that support both anaphoric and cataphoric inferences. Students identify and draw a line to connect the antecedent to the pronoun and record the correlating words on a chart. Teachers should begin with short sentences with just a few words between the antecedent and the

pronoun. After students become more skilled, then the number of words between the antecedent and the pronoun may be increased. This type of inference is essential for students to understand both narrative and expository text. Providing tasks that require anaphoric and cataphoric cueing supports comprehension as students learn to read longer passages and text.

Table 1. Anaphoric/cataphoric method

	Sentence (s)	Answer
Anaphoric inference	<u>Sam</u> fell to the ground before the finish line because <u>he</u> was tired.	Sam=he
Cataphoric inferences	<u>She</u> had such a great time that <u>Maria</u> wanted to play the game again.	she=Maria
Anaphoric inference with more complex sentence structure	<u>Tasha and Ryan</u> wore colorful costumes to the masquerade party. I was not surprised to see <u>them</u> later in the day with the First Place Trophy.	Tasha and Ryan = them

6. Paragraph/Passage Level Inferences

Students at the primary level gain reading proficiency by gradually learning to read words, sentences, paragraphs, and longer passages of text. Inference making is an integral component of reading competency as students transition from learning to read to reading to learn. Explicit instruction of inference making at the paragraph level provides an opportunity for students to make inferences regarding main idea, author’s purpose, analyzing perspectives, and evaluating the coherence of the writing [15]. Teachers who employ a strategy called “Here are the Facts!” can involve students in a game-like activity that is especially supportive of inference making using informational paragraphs and passages. Students are provided text evidence taken from previously read paragraphs or passages. Students are asked to underline or highlight the facts or evidence presented in the paragraph as they read the content so that they can later record the information. These facts are used as part of this strategy. Initially, teachers should select a simple paragraph with clearly stated facts. A sample

paragraph is displayed in Figure 4 to illustrate the activity.

I had never seen an animal larger than my classroom. The mammal lumbered with its big feet into the water. The animal must have weighed 3,600 kilograms to 4,500 kilograms. Its huge ears flapped in the wind. It was amazing to watch this creature spraying water with its long trunk to cool itself.

Figure 4. Sample Paragraph

The highlighted facts from the paragraph are listed on a chart one at a time by either students or the teacher. After each new fact is presented, students are asked to infer the topic and the key idea based upon that information. Students are prompted to refine their responses if needed as each new fact is listed. They are then asked to write a main idea statement that best conveys the main point inferred from the factual information as shown in the following table.

Table 2. Main idea inference chart

Text Facts	1. weighs 3,600 kg – 4,500 kg 2. huge ears 3. large feet 4. long trunk 5. mammal
Topic and Key Point	Topic = Elephant Key Point = Big
Main Idea Statement	Elephants are huge mammals.

The complexity of the task can be increased by analyzing paragraphs where some information is not relevant to the rest of the facts or evidence in the paragraph as in the following example activity:

The ground shook violently. People were thrown from their horse-drawn carriages because of the rocking roads underneath them. Many fires erupted all over the city. Buildings tumbled to the ground. Thousands died because of this natural disaster in the city of rolling hills on the bay. However, hurricanes pose their own danger. People who survived the earth-shaking natural event just wanted to forget the year 1906.

Figure 5. Complex Sample Paragraph

A chart is structured so that students can record the evidence and information presented in the paragraph. Students analyze the evidence in the paragraph to determine the main idea. If they find any facts that are irrelevant to the main idea, then that information is recorded in a separate section of the chart. This

task requires students to evaluate information to determine which facts support the inferred main idea.

Table 3. Main Idea Advanced Inference Chart

Text Facts	<ol style="list-style-type: none"> 1. ground shakes 2. people thrown from carriages-rocking roads 3. fires erupt in city 4. buildings are destroyed 5. thousands die 6. city with rolling hills by the bay 7. hurricanes are dangerous 8. 1906 earth-shaking event
Topic & Key Point	Topic = Great 1906 San Francisco Earthquake Key Point = destructive
List, if any, irrelevant information	Hurricanes are dangerous
Main Idea Statement	The Great San Francisco Earthquake of 1906 was devastating.

7. Text Level Inferences

The ability of students to infer and gain deeper meaning from text is a primary goal of teachers as their students transition from primary school to secondary school. Since inference making requires background knowledge, situational context, vocabulary, and the ability to notice cues and evidence in text, instructional strategies should combine these elements [15]. Teaching the cues and skills to make inferences during domain-specific study is a method to broaden students' content knowledge and vocabulary while deepening inferential thinking. A recent meta-analysis revealed that by combining science with reading instruction, students showed positive academic outcomes in both science and reading [16].

Teachers should use both narrative and expository genres to support text-level inference making. For younger students, beginning with narrative text provides more teaching opportunities for a variety of reasons. First, narrative text is typically a familiar genre for students. Many emerging readers listen to stories and read simple narratives. They become familiar with structure of stories and have many opportunities to make interpretations of the events and actions in them. Furthermore, stories are similar to everyday life occurrences with characters and problems to solve. Expository text tends to have unfamiliar and dense academic language that conveys new information which may be unfamiliar to primary students [17].

The following activities support students in making inferences while reading narrative text:

- a. Teacher models their thinking before, during, and after reading a brief narrative selection through a think aloud.
- b. Picture books that tell a story are a useful resource to demonstrate how visual clues can assist in inferring a character's motivations, feelings, and actions in a story.
- c. Ask how the title of the story is related to the content of the story. Be sure to ask students what content in the story supports their response.
- d. Emphasize to students to ask themselves "why" or "how do I know" questions throughout and after the reading of a narrative selection.
- e. Highlight and discuss causal clues in the story related to the plot, setting, and characters.
- f. Discuss how the author's physical and behavioral description of main characters correlates to the events in the story.

Narratives may serve as an entry point for primary students making text-level inferences, whereas expository text assumes a larger role in the education of students as they proceed through their primary education. Therefore, it is important to teach students how to use cues embedded in expository text to expand their inference making abilities [17]. Text should have a level of complexity that challenges the reader to use critical thinking skills to understand it. Common cues and strategies to support inference making of expository texts include the following:

- a. Have students underline or highlight facts in a passage and analyze a common connection of those facts to determine the main idea of a paragraph or passage.
- b. Model and teach how authors use transition words to help them convey the purpose of a particular informational piece. For example, an information passage might use the following words: both, in contrast, similarly, and conversely. These transition words are cues to the reader that the author is comparing and contrasting information.
- c. Identifying synonyms while reading expository text is a task that supports inference making. The more synonyms in the text means that more inferences are required to understand the text. Teachers might ask the following questions related to synonyms: Why was a specific synonym used? What can you infer about the topic based upon the synonyms identified in the text?
- d. Cloze activities provide students with practice using context clues to support making inferences. Specific content words from the sentences in a text passage are left blank. When the student reads, they use the context clues in the passage to infer the words that would best fit into the sentences. This activity requires that students pay close attention to the contents of

the text. If necessary, teachers can begin by using just one or two sentences to analyze and provide multiple word choices to complete the sentences.

8. Implications

In reviewing the research, the ability to make inferences is a strong predictor of enhanced reading comprehension [1]. Although students in primary school are learning to read, they can master the cues and skills necessary to make inferences by beginning with objects, pictures, words, sentences, and simple paragraphs. These skills may be adapted and applied to text as students develop their reading proficiency. Therefore, it is essential that teachers incorporate inference making skill instruction throughout the primary school grades.

9. Conclusion

The literature shows that the ability to make inferences from text is an essential skill for reading comprehension [3]. Various studies show that explicit instruction and cues support the development of inference-making skills with primary school students [4]. The integration of inference making instruction with foundational reading instruction enables students to become analytical readers.

10. References

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