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ENHANCING READING COMPREHENSION

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Dear Readers,

This article may be a challenge for many (it certainly was for us!) because Dr. Rosow addresses a reading comprehension topic in great detail that is not often covered: **propositions** (not prepositions). Propositions are the smallest unit of meaning beyond the single word, and understanding them is the essence of reading comprehension. Common reading comprehension strategies taught in the classroom, such as visualizing and finding the main idea, are not useful for students who can't comprehend what they read at the word, phrase, or sentence levels. Adults may experience this when attempting to comprehend scholarly text for which they lack background knowledge, such as law, medicine, or engineering. We can decode each word, but still not understand the meaning of every phrase or sentence, which reduces our overall passage comprehension.

When educators appreciate and address propositions in the classroom, students' oral and reading comprehension improves. In addition to sharing the concept of local-level comprehension, Dr. Rosow recommends approaches to directly teaching and formatively assessing it. We recommend reading the article *twice* (as we did) to ensure you fully grasp this frequently overlooked topic, and to **start with the *Terminology Key* on page 2.**

Drs. Brenda Warren and Dorinne Dorfman

Local-Level Comprehension: Reading for Meaning Within and Between Sentences

by Bruce Rosow, Ed.D.

Introduction: What is Text Comprehension?

The goal of reading instruction is to improve students' reading comprehension. We want our students to read with purpose for meaning. To this end, it is important to know what readers are doing, moment to moment, to translate print to meaning. When asked to describe how readers understand what they read, my graduate students commonly answer with lists of skills a reader needs to comprehend text: accurate decoding, efficient/fluent decoding, strong oral vocabulary, relevant background knowledge, finding main ideas from supporting details, and knowledge of strategies like self-monitoring, summarizing, and paraphrasing. Such lists are useful, but a collection of skills does not add up to an understanding of what readers are doing as they read to unpack and understand text. Irwin (1991) wrote, "We need a model of what is actually happening when a reader comprehends. If we can understand how comprehension occurs, then we can teach students to do it" (p.6).

Curious Question

When and *why* was standardized spelling in English established?

Terminology Key

Term	Explanation
Text Comprehension	The orchestrated product of linguistic and cognitive processes; understanding the meaning intended by the author
Local-level comprehension	Reading for meaning within and between sentences
Propositions	Idea units; the "atoms" of thought Propositions are linked by 3 types of hubs:* - Verb propositions link the verb to its roles - Adjective propositions answer: *What kind? How many? Which one*? - Connective propositions signal relationships, such as time, space, contrast, or causality (such as conjunctions, ***because, if, when, or***, etc.)
Argument	A role such as *doer*, *done to*, *done with,* or *location* assigned by a verb (see table p. 6).
Bottom-up processing (micro-processes)	Readers "mine" (dig and find) new information from text into propositions (idea units).
Top-down processing (macro-processes)	Information stored in memory, including knowledge of vocabulary and topic; top-down processes organize and connect new information to old knowledge.
Text base model	The literal meaning or basic understanding of a text Propositions that are integrated like links in a chain
Micro-selection	The most relevant parts *connect* to the sentence information.

*Editor's note: ***Hub*** is not a linguistic term, but the word Dr. Rosow uses with students to describe the center of activity that connects to other words.

In this article, we focus on what readers are doing at the local level, within and between sentences, to form a basic text base level of comprehension (Kintsch, 2005). Castles et al. (2018) state, "Comprehension is the orchestrated product of a set of linguistic and cognitive processes." (in Hennessy, 2022, p. 9) Our task is to identify the linguistic and cognitive processes needed for local-level comprehension, describe how these processes are orchestrated, and consider implications for instruction. To begin, we turn to models of comprehension from Irwin (1991) and Kintsch (2005), and consider bottom-up and top-down processing as a framework for both models. We then (1) explore micro-processes, (2) review the construction - integration cycle, and (3) end by examining integration instructions.

Irwin's Model of Comprehension

Irwin posits five essential cognitive processes involved in comprehension: micro-processes, vocabulary, integrative processes, macro-processes, and elaborative processes. Irwin adds metacognitive processes and emphasizes that cognitive and metacognitive processes interact. Irwin's interactive concept means that comprehension involves processing across many areas of the brain, occurring at the same time or in parallel, with bottom-up local micro-processes woven into top-down global macro-processes. These different levels of interactive processing work in sync within metacognitive control and guidance. Irwin's model has stood the test of time (Hennessy, 2022, p. 16).

Kintsch's Construction-Integration Model

Kintsch's (2005) Construction-Integration model aligns in many ways with Irwin's model. Kintsch also stresses the importance of bottom-up and top-down processing. Kintsch adds two important concepts: the construction-integration cycle and three levels of mental models. Kintsch's idea is that discourse processing occurs in a series of construction and integration cycles, involving bottom-up and top-down processing, resulting in different depths of understanding (Kintsch, 2012).

Bottom-Up and Top-Down

To understand both Irwin's and Kintsch's models, it is important to first explore bottom-up micro-processes and top-down macro-processes.

Bottom-Up: To start, read the next two passages, a procedure and a poem, containing bottom-up details but lacking top-down organization.

Passage 1

A Procedure (Bransford, J.D. & Johnson, M.K. 1972, p. 717)

The procedure is actually quite simple. First, you arrange things into different groups depending on their makeup. Of course, one pile may be sufficient depending on how much there is to do. If you have to go somewhere else due to lack of facilities, that is the next step; otherwise you are pretty well set. It's better to do too few things at once than too many.

What is the procedure being described?

Passage 2

Robert Pinsky, Gulf Music (2007)

Sometimes the sight of them
Huddled in their cylindrical formation
Repels me: humble, erect
Mute and expectant in their
Rinsed-out honey crock: my quiver
Of detached stingers. (Or, a bouquet
Of lies and intentions unspent)

What is the topic of the poem, Gulf Music?

The missing top-down information:
Example 1: The procedure = Doing the laundry
Example 2: The quiver of detached stingers = Pens

Notice how, when you learn the top-down organizing idea (doing the laundry or the pen), the bottom-up details fall into place.

Top-Down: This third example gives top-down information in the title as the situation is provided. Read this passage and check your comprehension before you move to the table below.

Passage 3

A Medical Resident Arrives for Work (Cain, 2025, Presentation, slides 12-16).

Angie rushed through the doors of the old brick building. She almost ran straight into a shadow gazer talking grim-faced with a blade. With a quick apology, she brushed past them for the pup rounds. She had to know if things were zero delta with yesterday's first hit. After all, what looked like a soapbox derby had turned into a bounce-back. No matter what happened overnight. It would make a great story to tell her father, the rear admiral.

What, if anything, is missing in your understanding?

"Specialized vocabulary (jargon) cannot draw on existing vocabulary/world knowledge" (Cain, 2025). Existing knowledge is top-down. Being new and unknown, the jargon is bottom-up and interferes with comprehension.

Medical Resident Vocabulary

Term	Meaning		Term	Meaning
a shadow gazer	radiologist		yesterday's first hit	first patient
a blade	surgeon		a soapbox derby	going down - worse
the pup rounds	patient visits		a bounce-back	getting better
zero delta	unchanged		her father, the rear admiral	proctologist

Comprehension consists of building a mental model based on (1) new information in the text (bottom-up), (2) information in memory and topic structure (top-down), and (3) how these processes interact (Kintsch, 2005). Initial information lays a foundation. Readers select and link information, building a text base mental model. Subsequent sentences are integrated as the text base is updated to reflect both local relations (bottom-up) and the topic structure (top-down) (Gernsbacher, 1990).

Construction-Integration at the Local Level: Within and Between Sentences

Constructing Propositions: Readers, as they read, use information by constructing propositions. Propositions are idea units, like atoms of thought. A proposition is the smallest unit of meaning beyond the single word, such as inferencing and connecting to other content.

Verb propositions establish the meaning of a clause, with a verb hub linked to its arguments. (The term argument here does not mean bickering.) Argument refers to a role or job, such as doer, done to, done with (chart on p. 6), assigned by a verb. Propositions are also built with adjectives or with signal words. Signal words act as signposts to guide the reader from one proposition to the next. These can be prepositions, such as in the morning, down the street, and after school. Signal words can also be connectives, such as conjunctions like and, for, while, since, and because. Adjective propositions add detail, such as the very hungry caterpillar, while connector propositions signal relations between propositions.

In propositions that use information in a clause, the verb is the boss. The verb assigns the roles. Here are examples of the verb, as the boss and hub of a proposition, assigning roles.

The children loved art. The proposition = (loved: children, art)
The verb ***loved*** assigned two roles or arguments: a doer (children) and a done to what? (art).

The dog is under the house. The proposition = (is under: dog, house).
The verb ***is under*** assigned two roles or arguments: a doer (dog) and a done to what? (house).

Micky owed his dog a donut. This sentence has two propositions =
1st proposition (owed: Micky, dog)
2nd proposition (owed what?: dog, donut)

The verb ***owed*** assigned three roles or arguments: ***who owed?*** (Micky), ***owed whom?*** (dog), and ***owed what?*** (donut). The owed what? role is accounted for in the second proposition. The dog is in both propositions.

Integrating Propositions: Propositions are elaborated upon or linked using propositions with adjective or connector word hubs. In this example, proposition 3 with the connector ***when***, links or integrates propositions 1 and 2.

Jordan kissed the pig when Sabrina won the race.
Propositions: 1 – Kissed: Jordan, pig
2 – won: Sabrina, the race
3 – when: connects 1 to 2

An experiment by Ratcliff and McKoon (1998) demonstrated that readers do actually process information at the local level by constructing propositions, linking verbs with assigned roles. Ratcliff and McKoon named this experiment, "priming the pump," to reflect the way verbs sit at the hub of a network of linked arguments. Subjects were asked to read sentences like the ones below. Propositions (unseen by subjects in the experiment) are added beneath each sentence to illustrate the argument structure the reader theoretically builds in a construction – integration cycle.

Geese crossed the horizon as wind shuffled the clouds.

The reader first constructs two propositions, one for each verb hub (crossed, shuffled). The two propositions are then linked in proposition 3 using the connector hub ***as***, meaning happening at the same time. *See the next page for propositions in the geese sentence.*

1 – crossed: geese, horizon
2 – shuffled: wind, clouds
3 – as: connects 1 to 2

The mausoleum that <u>enshrined</u> the tsar <u>overlooked</u> the square.

Here, the reader again creates two propositions to account for the two verbs and their arguments. Proposition 3 links or integrates ***that***, to include that the enshrined tsar is in the mausoleum overlooking the square. That is, because ***tsar*** and ***square*** are not in the same proposition, the reader needs proposition 3 to link them.

1 – enshrined: mausoleum, tsar
2 – overlooked: mausoleum, square
3 – that: connects 1 to 2

In these two examples, steps 1 and 2 show the construction of propositions. Step 3 shows integration. Propositions 1 and 2 are linked by proposition 3, like two links in a chain. Creating a network at the local level in the construction- integration cycle means linking important propositions to create and continually update a mental map, a literal rendering of sentences.

In Ratcliff and McKoon's experiment, the text was removed, and subjects were presented with words in columns. The task was to go down each column and check ***Y*** if the word appeared in a sentence and ***N*** if it did not. The key independent variable measured was <u>the speed</u> of an accurate response.

Geese	Y or N		mausoleum	Y or N
horizon	Y or N		square	Y or N
wind	Y or N		injustice	Y or N
wood	Y or N			

Ratcliff and McKoon found that readers were faster choosing ***Y*** for horizon after geese, than ***Y*** for wind after horizon, even though horizon and wind are closer together in the sentence. This is because geese and horizon are in the same proposition, while horizon and wind are not. Thus, horizon does not prime wind, and there is a slower response time in choosing ***Y*** for wind. The researchers also found a fast ***Y*** response for square after mausoleum. The two terms are far apart in the sentence, but they are in the same proposition.

"Comprehending sentences involves extracting the meaning of interconnected sets of propositions (ideas) that, in turn, depend on semantics and the syntax used within the text" (Hennessy, 2022, p. 42). Students may struggle to build, link, or integrate propositions when the complexity of text increases, as it does with academic language.

The Verb is the Boss: Mandatory and Optional Roles

In forming main propositions that map the meaning of clauses, the verb is the boss. A sentence is complete when the verb is satisfied. An agent or ***doer*** (***done by who*** or ***what?***) is needed by the verb. Many times, a direct object (***done to***) is also needed. Sometimes a location (***done where?***), or an instrument (***done with what?***), is needed. Some questions are mandatory. Unless they are answered, you don't have a sentence. "I put." is not a complete sentence. You need ***put what***? and ***put where***? A useful strategy to unlock the meaning of a difficult sentence using a bottom-up approach is to identify the main verb or verbs, and the arguments they assign, and build propositions that capture the information contained in the sentence.

Teachers can cue students to form propositions by asking questions. If the question is ***who or what "verbed"?*** (did the action), the answers are nouns or noun phrases. If the question is ***when, where, why,*** or ***how did something verb?***, the answer is an adverb and/or adverbial phrase. In semantic terms, the answers fill roles as assigned by the verb. Questioning clarifies these relationships. Using common sense terminology, here is a table of possible roles:

Role	Common Sense Name The …	Question
Agent	Doer	Who or what (verbed)?
Patient or Theme	Done to whom or what	(Verbed) to who or what?
Location	Done where	(Verbed) where?
Goal	Done why, or for the sake of what	(Verbed) why? (Verbed) about what?
Source	Done from	(Verbed) from where?
Instrument	Done with what	(Verbed) with what?
Time	Done when	(Verbed) when?
Cause	Done by	(Verbed) by who or what?
Owner	Owned by	Whose (verbed)? by who or what

When reading academic text, comprehension at the local level can be taxing. Academic text includes complex sentences, new vocabulary and jargon, and new concepts that stretch background knowledge. The questioning strategy is one way to cue students to untangle information found in challenging, complex text.

Integration and Mental Models

Kintsch poses three levels or mental models of text comprehension within the construction-integration process: the surface level, the text base level, and the situational model.

The surface level includes the exact wording of each statement. The exact wording is held in short-term memory. These form a ***text base**** from which a mental model is formed as propositions in the sentences become linked or integrated, like links in a chain, holding the literal meaning or basic understanding of a text. The text base is stored in long-term memory, like neighboring cells in a graphic novel. This detailed, episodic memory fades without rehearsal. When students take notes, review their notes, paraphrase, summarize, or review vocabulary as when studying for a quiz, the text base model is rehearsed, reinforced, and retained longer.

***Text base** is "the level of meaning in a text that represents the author's intended message" (Reading Universe, 2026).

The situation model contains main ideas, called the ***gist***. In Kintch's view, comprehending the gist takes a reader beyond a text base understanding. Situation model comprehension involves integration with general knowledge, activation of related schema and context, integrating new with old information, and making new connections to reach a deep level of understanding. Students struggle with reading comprehension if they do not have "the ability to integrate sentences within a text and the ability to integrate information in the text with general knowledge." (Cain & Oakhill, 2007, p. 54). The situation model is the most durable in memory.

Answer to this issue's Curious Question: According to Baugh and Cable (2013), English spelling became standardized in about 1500, during the Renaissance. Factors included "the printing press, the rapid spread of popular education, increased communication and means of communication, the growth of specialized language, and the emergence of various forms of self-consciousness about language" (p. 198).

However many of these standardizations have since evolved. For example, many words with silent e were dropped (such as ***harte, moste,*** and ***takinge***). Americans Noah Webster and Benjamin Franklin attempted to develop unique, more phonetic American spellings, but were only partially successful, such as reversing ***re*** to ***er*** in words like ***center*** and ***theater***. Franklin's plan to eliminate ***C, J, Q, W, X***, and ***Y*** and add some of his own creations was rejected, as was the Mormon's midnineteenth-century Deseret alphabet of entirely new letter forms.

Changes in spelling and grammar continue to be adopted across many languages today, though not all media outlets comply.

Instruction to Support Text Base Comprehension

Example 1: Here is an example, using a typical social studies passage, of construction - integration instruction at the local level to support text base comprehension. We start by identifying verbs and *adjectives*, and then building the proposition structure (also termed argument structure) (Moats & Rosow, 2020).

Step 1: The *first* civilizations of the world began in river valleys where *abundant* supplies of water made it possible to grow sufficient crops to support *large* populations.

Proposition Structure

1 – began: civilizations, river valleys
2 – first: civilizations, connects to 1
3 – where (location): river valleys, supplies of water
4 – abundant: connects to 3
5 – began: connects 1 to 2, connects 3 to 4
6 – grow: connects to 1, crops
7 – sufficient: crops
8 – support: connects 6 to 7, large populations
9 – made: connects to 5, connects 6 to 8

Step 2: Ask basic questions based on propositions with verb hubs and adjective hubs, to construct propositions. When integration of propositions is needed, ask students to paraphrase as modeled below in (5) and (9).

1 – What began? civilizations
2 – What kind of civilizations? first civilizations
3 – Began where? in river valleys with supplies of water
4 – What kind of water? abundant water
(5 – Paraphrase: The earliest civilizations are found in valleys with rivers and plentiful water.)
6 – Grow? connects 1 to 2, crops
7 – What kind of crops? sufficient crops
8 – Support what? connects 6 to 7, large populations

(9 Paraphrase: Civilization started in river valleys, where plentiful water made it a good place to grow crops and feed a lot of people.)

As propositions are constructed, integration happens in cycles. In steps 5 and 9, the reader links or integrates propositions to form, improving their text base understanding. Strong readers make these adjustments at great speed, mostly automatically, without much conscious awareness. Poor comprehenders can struggle to link or integrate propositions. They may develop too many unconnected propositions rather than a fully integrated concept. Too many propositions are built that do not connect to the real structure of the text (Whitney, 1998). An example of disconnected propositions with fragmented links can be seen in the writing of my former student Zach, age 14 at the time. Zach was supposed to write about a character; he chose Skyler the Dangerous, an invention of his own making.

Student Work Example 1

Skyler the Dangerous - by Zach

I built my first air plane when I was 15 teen years old. I like flying planes to. My favorite trick on a plane is mixtwix and Hershey. My favorite candies are Twizzlers, Three Musketeers, and Skittles. Tropical and chocolate candies are my favorite candy. I have a dog...

In the integration phase, the most relevant parts connect to common content or themes (called micro-selection). The connection can be a referent that repeats such as a character, a topic, or the context (for Zach, a battle). Zach loses track of a common theme. He begins with describing an airplane and ends up mentioning his dog, and leaving out Skyler! Elements from each sentence are dropped in each sequential sentence, and we are left with fragmented text.

In cohesive text, the content is linked, new to old. The most important elements from the previous sentence are kept in working memory to facilitate local connections. Each new sentence is integrated with previous information. New information is added to old information; new to old; new to old, in continually updated, construction – integration cycles (Kintsch, 2005). For students struggling with local-level comprehension, paraphrasing or restating helps them integrate propositions at key points.

Comprehension can break down at a local level when readers struggle to construct propositions, or fail to link or integrate propositions. The student in Example 2 below struggles in both of these areas. Instruction includes identifying main verbs, using questioning to build propositions, going back to the text to use information and define terms, and paraphrasing to support local-level integration. First, read the text.

Student Work Example 2

Protozoans: There are tens of thousands of species (kinds) of protozoans. Protozoans live in moist places. They are found in salt water, fresh water, and soil. They also live in the bodies of plants and animals. Many protozoans can form cysts (*protective* coverings) that let them survive drying.

We break this lesson into three parts. We underlined two key verbs, live and form, and italicized a key adjective, *protective*, to use as proposition hubs. In the first two rounds the student constructs propositions based on the verb live and the adjective *protective*. In round 3, the first two propositions are linked / integrated, with the verb form as the proposition hub, completing this construction - integration cycle.

Part 1: Construction – Key verb proposition: (live: protozoans, in moist places)

Teacher: Where do we find protozoans?

Student: I'm not sure. [I had the student reread, ***Protozoans live in moist places.***]

Teacher: What kinds of places? [cueing]

Student: Moist.

Teacher: What does moist mean?

Student: Wet.

Teacher: Like where?

Student: Salt water. [Push the student to link ***moist*** with salt water, fresh water, wet soil, in our bodies and in animals.]

Teacher: Only salt water?

Student: Fresh water.

Teacher: Where else? [and so on]

Teacher: Can you put it together in your own words?

Student writes: Protozoans live in wet places like salt water, fresh water, in animals and in the wet ground.

Part 2: Construction – Key adjective proposition: (protective: cysts, drying out)
[Return to the text]
Student reads: Many protozoans can form ***cysts*** (protective coverings) that let them survive drying.

Teacher: What's a cyst?

Student: I don't know.

Teacher: What does the text tell us? [Don't answer. Redirect the student to the text.]

Student: Protective covering?

Teacher: What does protective mean?

Student: Protection from something?

Teacher: Like what?

Student: I don't know? [Notice the student has another broken link. Redirect back to the text.]

Teacher: What does the text say?

Student: Drying.

Teacher: Can you restate what you know about cysts?

Student: Cysts are covers that protect stuff from drying out.

In Example 2, the student has constructed the two main propositions, but has not linked them, and needs more support.

Part 3: Integration:

Proposition 3: 1 – live in: protozoans, moist places
2 – protective: cysts, drying out
3 – form: protozoa, cysts

Teacher: What does "survive" mean? [Review connection between live in, protozoans, and moist places.]

Student: To live.

Teacher: Where do protozoans live?

Student: In moist places.

Teacher: What happens when places become dry?

Student: There is no water.

Teacher: Right? So what do protozoa do if it gets dry? [Cueing support for the student to link protozoans, moist and cysts.]

Student: When it is dry, they form cysts.

Teacher: Great. How does forming cysts help?

Student: Protozoa form cysts to cover and protect them when it gets dry.

Teacher: Isn't that cool?

We can make a lot of assumptions about what students are understanding when they read text. It is easy to miss local-level comprehension problems because for good readers, unless they are confronted by complex text, local-level comprehension happens automatically. For struggling students, weak local-level comprehension requires intervention at the local level. This includes teaching students to:

1. attend to **verbs** to build propositions
2. attend to **signal words** to integrate propositions, and
3. attend to **adjectives** to add important detail.

Local-level comprehension instruction also requires students to work from and return to the words in the text to clarify new vocabulary and restate or paraphrase when integration is required.

Integration Instructions: Referents, Signal Words, and Slot-filling Inferences

Our final stop is to look at specific integration instructions in text used to connect or link propositions and form a coherent text base. Integration instructions act as glue. They link items and signal relations between propositions. Their use involves mainly, but not entirely, bottom-up processing. Three types of integration instructions are:

- Pronouns, anaphora, ellipsis, and co-referents
- Connectives and other signal Words (prepositions and conjunctions)
- Slot-filling inferences

Pronouns, Anaphora, Ellipsis, and Co-referents

Readers integrate new information with old information based on common content. Common content includes characters, or topics, or contexts and situations. Once introduced and named, a content item becomes an antecedent (ante = before). The job of a referent is to refer back to an antecedent. Referent types include pronouns, anaphora, ellipsis, and co-referents. It can be hard to link referents back to antecedents, in part because there are multiple ways to refer to the same character or topic, and in part due to complex syntax. The exercises below introduce how pronouns, then anaphora, ellipsis, and co-referents work (from Moats & Rosow, 2020).

I. Pronouns: Pronouns can be slippery because it is not always easy to link pronouns to their antecedent. Identify the referent of the underlined pronoun.

Example 1
Bert lent money to Fred because he needed it. Fred needed it.
Jose lent money to Pete because he was generous. Jose was generous.
How did you know the antecedents for 'he?' The reader makes inferences based on context; who needs money and who can afford to be generous.

Example 2
Today, with the advances in genetics and biochemistry, biologists can look more closely at individuals to discover the pattern of evolution, and group them accordingly – this strategy is called evolutionary classification. them = individuals

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II. Anaphora: Anaphora is the replacement of a whole noun phrase, thought unit, or sentence with a pronoun. Identify the anaphora referenced by the underlined pronoun in the following examples.

Example 1
Marie ate the grasshoppers that Andrea baked with apples. Afterwards, she washed it down with some bug juice. it = baked grasshopper and apple

Example 2
At lunch, when I ate prunes, peaches, and plums with you, it was fruitful, but now I need a pit stop. it = When I ate prunes, peaches, and plums with you

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III. Ellipsis: Ellipsis is the presence of an absence. A reference is made out of thin air, through context. A local-level inference leads most readers to fill the referent automatically. We note with the letter **X** the place where the ellipsis occurs in the following sentence pairs.

Example 1
Slid was the only snake in the vicinity. He expected another would show up soon.
He expected another **X** would show up soon. (**X** = another snake)

Example 2
The Natives fought more of a guerrilla war, as did the Colonists in driving the British back to Boston.
The Natives fought more of a guerrilla war, as did the Colonists **X** in driving the British back to Boston. (**X** = fight a guerrilla war)

IV. Co-referents and Local Cohesion: A co-referent is another name for the same thing. Note the co-referent for the underlined noun in these examples.

Example 1: This next passage comes from a middle-school biology textbook.

Cladistics is a form of analysis that looks at features of organisms that are considered, "innovations," or newer features that serve some kind of purpose. (Think about what the word "innovation" means in common language.) <u>These characteristics</u> appear in later organisms but not earlier ones and are called derived characteristics.

These characteristics = "Innovations" = newer features that serve some kind of purpose.

Example 2: History texts are filled with co-referents that commonly confuse readers. This passage comes from *Bull Run* by Paul Fleishman (1993). Find the co-referent for '*a duty*.'

"As commander of the Army of the Potomac, I was expected to crush the Confederacies' army and, if need be, take Richmond, its capital, despite the fact that my success depended on keeping the Confederate Army in the west from leaving Harpers Ferry and joining Beauregard, a duty given to General Patterson who was too old and too timid for this or any task."

A duty = keeping the Confederate Army in the west from leaving Harpers Ferry and joining Beauregard

Instruction that teaches students to link referents to antecedents is critically important. Cohesion comes from linking common characters and themes across sentences. Readers can lose track due to difficulty linking pronouns to antecedents, difficulty following co-referents, and difficulty juggling all the names of actors and places. In the passage above, some students will not know where to place General Patterson or what 'a duty' refers to.

Signal Words: Conjunctions and Prepositions

The Institute of Educational Services Practice Guide (2007) recommends teaching students about academic language starting in the early grades. They define academic language as the language used in content area text including science, history, and literature. They recommend focusing on conditional sentences, prepositions, and words that express relationships.

Earlier, we constructed propositions using prepositions and conjunctions at the hub to express relationships and to link propositions. These are often called signal words. Signal words signal relationships between idea units or propositions to facilitate integration. A preposition starts with a prepositional phrase and signals where nouns are located in time, space, or in other relation (such as ***down*** the street, ***in*** gratitude, or ***on*** Saturday)

Conjunctions (***and, but, though, since,*** etc.) often link clauses containing a verb and its arguments (roles). Conjunctions signal many kinds of relations as noted in the table below. Overall, signal words act like street signs to direct the flow of ideas.

Example 1
Although insect populations can fluctuate greatly even in normal conditions, the steady downward drift in the butterfly's numbers is worrisome.

Insect populations can fluctuate ← although → the steady downward drift in the butterfly's numbers is worrisome.

Although signals contrast or contradiction:

Example 2
Article 43 (Newfane Report, 2025): Shall the voters of the town of Newfane approve relocating future town meetings to the NewBrook Fire Department **and/or** Newbrook Elementary School?

The former town moderator noted three different meanings from the signal words **and/or**

1. Future town meetings will be at the Newbrook Fire Department.
2. Future town meetings will be at the Newbrook Elementary School.
3. Future town meetings will be at both.

An amendment was approved to strike ***and***.

Signal Word Relations

This table lists types of relations for signal words. By signaling relationships between two or more propositions, signal words facilitate integration.

Types of Relation	Example	Signal Word Bank
1) time or sequence	The pumping station continues pumping for 6 more hours <u>while</u> the leak is undetected.	before, after, when, until, as long as, later, at, while, first, second
2) location	<u>Across</u> the river, Lee's line waited <u>on</u> the ridge, protected by a stone wall and trees.	behind, across, between, onto, over, by
3) addition, conjoining	Many kinds of vegetables <u>such as</u> squash, succotash, cucumber and tomato are actually fruits.	and, next, in addition to, also, along with, furthermore, likewise
4) causation	<u>Since</u> we ran out of gas we had to walk back to town to find some.	because, accordingly, hence, therefore, thus, consequently, since
5) reversal or contradiction (adversative)	<u>Unlike</u> Union forces, Southerners would be fighting a defensive war in their own territory.	even though, unless, but, however, if
6) conditionality	<u>If</u> wishes are fishes, <u>then</u> it will snow tonight!	If…then; either…or; both… and; not only…but also
7) compare	You are <u>as</u> constant as the northern star whose true fix and resting quality there is no fellow in the firmament. (Shakespeare, Julius Caesar, Act 3, Scene 1)	as, also, like, similarly, likewise, or

Signal Word Instruction

Here are a few examples of instruction using signal words.

1. **Boxing words:** When students are unsure of the meaning of a sentence I usually ask them to box signal words. We first box signal words that link clauses. Then we discuss the relationship signaled.

The North had nine times more industry **while** the South's economy weighted heavily on cotton.
While = time sequence and contrast

2. **Graphic maps:** Signal words are helpful street signs to transpose a sentence or passage onto a graphic map.

Economy

North: nine times more industry	**while**	South: cotton

Graphic maps can be organized by signal words and the relationships they signal. The *Thinking Maps* curriculum (Hyerle, & Yeager, 2007) teaches flexible use of graphic maps to match logical forms of thought signaled by signal words (see Table of Signal Word Relations above). One strength of this curriculum is that teachers are encouraged to go beyond handing out graphic maps as a fill-in-the-blank activity, and instead flexibly using graphic maps in response to signal words and types of questions.

3. Occasion / position topic sentences: In Auman's (2015) curriculum, *Step Up to Writing*, students are taught to write occasion / position topic sentences. Signal words act as subordinating conjunctions introducing the occasion, as a dependent clause. A dependent clause cannot stand alone. This sets up needing an independent clause position response. You can prime the pump by providing dependent clause starters. Students respond with their ***opinion/ position*** statements in the second column.

Occasion (dependent clause)	Position (independent clause) - Students add their own, such as:
If you try kale,	you may like it and become healthier.
When you drink soft drinks,	you may get more cavities.
Because humans struggle to limit carbon emissions,	air pollution remains a big problem.

4. Sentence anagrams: This sentence anagram is designed to be solved using signal words and reference links that make finding the solution like putting together puzzle pieces.

a. <u>and</u> cried until my ribs ached
b. <u>then</u> fell down
c. I ran without thinking
d. hidden by the long wheat
e. <u>for</u> miles it seemed

For more information on complex sentences, see *Teaching Reading in Brief, Vol. 5*, No. 3, Teaching Syntax to Improve Reading Comprehension.

Slot-filling Inferences

Readers, mostly automatically, fill in information that is missing in the text. We introduced this concept when we discussed ellipsis, linking a referent that is implied to its antecedent. Here is a brief introduction on how slot-filling inferencing works.

1. Minimalist
We only make inferences when necessary (from Whitney, 1998). Compare the following paired statements.

Mary poured some coffee and absentmindedly stirred it. She failed to realize that the spoon had been licked by the dog.

Inference: Though not stated, most readers infer that the spoon was used to stir coffee.

2. Meaning intended but not directly stated

The following quote is found in George's (1972) *Julie and the Wolves.*

Pressing her ear to the ground she heard the vibrations of many feet – a herd of caribou was not far away.

Inference = A herd of caribou caused what she heard, the vibration of many feet.

It was the first one they had seen and so they wandered curiously around the kill, watching their elders.
Inference = The kill refers to the first one.

3. Bridging inferences needed across sentences

Marceau kept supplies in a basket as we climbed Dover Mountain. The sandwiches were delicious once we reached the top.

Inference: What sandwiches? = sandwiches come from supplies in a basket.
Inference: Top of what? = ***Top*** is the co-referent for *Dover Mountain*.

Finally, in another quote from *Julie and the Wolves*, this slot-filling inference relies on background knowledge as a top-down ingredient.

She had a large hare in her mouth and although Miyax was glad for the food, she was distressed to realize that her pack was not eating well.

Inference: Wolves usually eat bigger game. Hunting hares is a sign of the scarcity of big game.

Conclusion

We began with Irwin's (1991) advice that understanding the mind of a reader as they read for meaning will help guide instruction. We explored what a reader does, within and between sentences, to read for basic meaning that Kintsch (2005, 2012) calls text base comprehension.

Irwin and Kintsch both use the framework of bottom-up micro-processing, top-down macro processing, including their interaction. Bottom-up processing refers to how a reader collects or mines new information from the text. Top-down processing refers to how a reader connects new information to old information from memory and related content and organization. Both bottom-up and top-down processes work together as a reader constructs meaning. This framework is used to inform instruction, and to diagnose if a student's comprehension struggles are due to bottom-up processes, top-down processes, or the orchestration between the two.

Kintsch explains that a reader's mind operates in construction - integration cycles. Readers construct propositions, the smallest idea units, then integrate them to build basic understanding or a text base mental model. They build propositions by linking a verb to the roles it assigns such as ***done by*** or ***doer***, ***done to*** or ***object***, ***done where*** *or* ***location***. These roles are called arguments. To unpackage meaning in complex sentences, students can start with the verb. They can ask questions to link roles assigned to that verb. Teachers encourage students to go back to the text and construct accurate and complete propositions as a mostly bottom-up process.

Other kinds of propositions, or idea units, use adjectives or connectors at the hub. Adjective propositions add detail. Connector propositions (conjunctions and prepositions) provide links and relationships between idea units, critical for integration. Propositions are integrated within and between sentences linked by common content that helps readers build and continually update a coherent text base mental model. Students benefit from learning to read, then regularly stop to restate/paraphrase in doing construction-integration work.

Integration instructions act as glue when building and linking information. Integration instructions include referents and antecedents, signal words (prepositions and conjunctions) and the relationships they signal, and local (within and between sentences) slot-filling inferences. Text can be challenging due to the overuse or misuse of pronouns and co-referents, complex sentence structure requiring the use of signal words to unlock relationships between idea units, and challenging slot-filling inferences. Insight about where breakdowns in building or linking propositions are likely will inform explicit and targeted comprehension instruction.

We have focused on readers constructing a text base mental model. This level of comprehension is necessary but not sufficient. We want students who can do more than just repeat back what they read. The goal is for deeper understanding that includes synthesis, analysis, generalization, and application. Here is Kintsch's take on the matter: "Shallow superficial comprehension is such a problem in schools. Students can regurgitate what the teacher or the book said, but they lack deep understanding. They may have constructed a text base representation, but they failed to construct

a new situation model or update an already existing knowledge structure" (Kintsch, 2012, p. 24). Understanding how readers form a text base model is important, but more is required to achieve our goal of helping students read for a purpose and achieve deep, rich comprehension.

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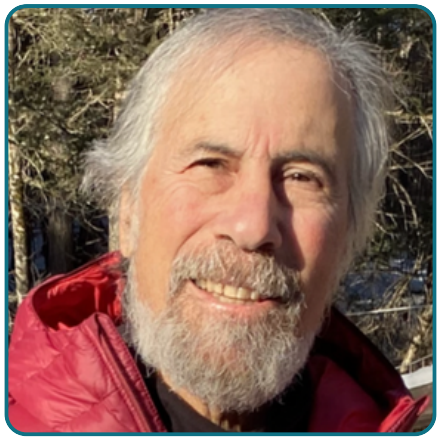
Meet the Writer and Editors



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Dr. Rosow has been an educator for 40 years. He has worked with students from pre-kindergarten through graduate school. Dr. Rosow began his career as an intermediate grade classroom teacher at Guilford Elementary School. Starting in 1991, he began training in structured-literacy instruction, studying with Dr. Louisa Moats at the Greenwood Institute. In 2008, Dr. Rosow completed his doctoral studies in educational psychology at American International College. Over this time, and for close to a decade, Dr. Rosow served as the Academic Dean of the Greenwood School, working with middle and high school students.

He then returned to public education, working in the Windham Central Supervisory Union, where he created and ran the Language Lab, providing remedial instruction to struggling readers. For almost two decades, Dr. Rosow also taught in the Language and Literacy Program at The Reading Institute, Simmons College and Bay Path University. Dr. Rosow and Dr. Moats recently completed the revision of *Spellography*, a word study curriculum for intermediate-grade students (95% Group, 2024). Dr. Rosow also co-authored the *Speech to Print Workbook*, 3rd Edition with Dr. Moats (Brookes, 2020). Dr. Rosow continues to tutor students, write curriculum, train teachers, and advocate for students with learning differences.


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Hallie Cohen's expertise in structured language and literacy is grounded in extensive training and over 30 years of teaching experience. She currently serves as a language therapist and assistant to a speech-language pathologist at the Greenwood School in Putney, VT. Hallie is a Certified Academic Language Therapist and an Orton-Gillingham practitioner. Hallie's certifications include: Certified Academic Language Therapist through Academic Language Therapist Association and the International Multisensory Structured Language Education Council; Certified Structured Literacy Dyslexia Interventionist through the Center for Effective Reading Institute; Advanced Orton-Gillingham training through Mayerson Academy, Mt. St. Joseph; and Orton-Gillingham trained through the Children's Dyslexia Center. To expand her understanding of structured-language approaches, she trained in Lindamood-Bell's Visualizing and Verbalizing and Wilson's reading programs. In addition, Hallie has training in the alphabet phonics approach through Literacy Through Multisensory Teaching, a cohort established by Judith Birsh at Columbia Teachers College. Last year, Hallie began presenting her work on sentence-level comprehension at national conferences in New York and Georgia. She attended the Ohio State University, State University of New York - Binghamton, and Ithaca College, receiving degrees in music performance and education.

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