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Constructing Mental Models in Literary Reading: The Role of Interpretive Inferences

Abstract: To construct a coherent mental model of a text, readers generate inferences. This chapter draws on cognitive theories of text and discourse to examine how and under what conditions readers construct interpretive inferences about nonliteral aspects of literary works. We examine what role these inferences play in literary sense-making and how they influence readers' comprehension of and experience with the text. We describe the variety of measures used to examine the interactive effects of task (e. g., reading goals), text (e. g., genre, complexity, foregrounding), and reader (e. g., expectations, prior knowledge, epistemology). We also review the types of questions that allow examination of when and how interpretive inferences are constructed. Finally, we discuss the theoretical and educational implications of these findings and explore potential future directions in this area of research.

Introduction

Although skilled readers may not always be aware of them, literary reading requires a variety of cognitive processes. Take, for example, the final lines from Alice Walker's (1974) short story, *The Flowers*. In this story, a young girl named Myop has been enjoying a summer's day, gathering flowers near her family's sharecropper cabin, until she finds the body of a dead man in a field:

> [...] Myop began to circle back to the house, back to the peacefulness of the morning. It was then she stepped smack into his eyes. Her heel became lodged in the broken ridge between brow and nose, and she reached down quickly, unafraid, to free herself. It was only when she saw his naked grin that she gave a little yelp of surprise[...]
> Myop gazed around the spot with interest. Very near where she'd stepped into the head was a wild pink rose. As she picked it to add to her bundle she noticed a raised mound, a ring, around the rose's root. It was the rotted remains of a noose, a bit of shredding plowline, now blending benignly into the soil. Around an overhanging limb of a great spreading oak clung another piece. Frayed, rotted, bleached, and frazzled–barely there–but spinning restlessly in the breeze. Myop laid down her flowers.
> And the summer was over.

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At its most basic, reading this passage requires a complex set of cognitive processes that support the acts of reading and deriving meaning (Perfetti & Stafura, 2014) and constructing a mental model that represents both explicit content conveyed in the story plus inferences that establish coherence (McNamara & Magliano, 2009). However, a *literary* reading of this excerpt involves more than just understanding the events (Bortolussi & Dixon, 2003; Goldman et al., 2015; Lee & Goldman, 2015; Miall & Kuiken, 1999; Rosenblatt, 1978). A person engaged in a literary reading might recognize the imagery of the noose and connect it to the devastation of slavery and Jim Crow. They might note the unusual nature of the name "Myop" and its similarity to the word "myopic," and they might begin to question whether the protagonist is blind to the world around her. They might also note the contrast between the short, standalone sentence "And the summer was over" and the paragraph that preceded it. They might consider the negative connotations of the end of summer, as well as the conventional Western symbolic meanings for the seasons, which might lead them to reflect that this story is about not only the end of a season, but also the loss of innocence of a young girl in the face of brutal racism. A reader who engages with the text in this way constructs not only a literal representation of the story, but also an enriched mental model that may include multilayered, interpretive inferences about the work.

This chapter draws on cognitive theories of text and discourse (e. g., Graesser et al., 1994; Kintsch, 1988; see McNamara & Magliano, 2009) to examine how and under what conditions readers construct *interpretive inferences* about nonliteral aspects of literary works. While literary reading relies on many processes that support comprehension across other types of texts (e. g., expository, narrative) and disciplines (e. g., science, history), this opening example shows that literary reading presents potentially distinct processes and strategies that may not be well described in current models of discourse comprehension. In addition to the basic inferences that connect sentence to sentence, literary readers can also generate additional inferences that help to create a larger meaning. For example, in the case of *The Flowers*, they might perceive that Alice Walker's imagery of a frayed and rotted noose invokes the brutality of racism. They might also infer that Myop's laying down of flowers is symbolic of the loss of innocence and they may note a mood of sadness and finality in the single last line.

This chapter describes the research designed to better understand the role of interpretive inferences in constructing literary mental models. First, we provide background on prominent theories of discourse comprehension and the critical role of inferences in constructing a coherent mental model. Second, we discuss literary reading as a goal-directed process that relies on the construction of interpretive inferences and describe methods used to investigate them.

Third, we highlight several major questions researchers have addressed in studies of interpretive inferences, followed by an outline of some future directions for the study of literary reading.

Theoretical Foundations

Theories of discourse comprehension posit that, as people read, they construct a mental model of the information presented in the text, and that successful comprehension occurs when readers establish *coherence* in their model (Gernsbacher, 1991; Graesser et al., 1994; Kintsch, 1988, 1998; van den Broek et al., 1999; Zwaan & Radvansky, 1998). To construct a coherent mental model, readers generate inferences that connect information across different parts of one text or many texts, or integrate information in a text with prior knowledge (Graesser et al., 1994; Kintsch, 1988). A main focus of discourse comprehension research is the evaluation of these different types of inferences (McNamara & Magliano, 2009).

Definitions of inference

Philosophical approaches to inference are based in formal logic and generally distinguish between *inductive* (moving from a specific premise to a generalization) and *deductive* (moving from a general premise to a specific instance). Logical inferences are often seen as supporting the construction of mental models, specifically in the context of reasoning tasks (Johnson-Laird, 1983), and there is some evidence that logical inferences can occur in the context of text comprehension (Lea, 1995; Lea et al., 2005). In contrast, discourse theories describe *knowledge-based* inferences. Magliano and colleagues explain that "the primary difference between these quantitative-logic inference categories and knowledge-based inferences is that [logic-based inferences'] truth value is based on abstract, decontextualized rules of inference (e. g., transitivity) whereas the truth value for knowledge-based inferences is based on some referential world" (Magliano et al., 1996, p. 202).

One could describe many of the inferences that readers generate when reading literature as inductive and/or deductive in nature. For example, a reader could draw on specific inferences about Alice Walker's last line to build general thematic interpretations about loss of innocence; they could draw on general understandings of the literary significance of repeated images to make infer-

ences about the imagery of flowers in Walker's story. However, as described in theories of discourse comprehension, these inferences are not construed as a form of logical inference, because these inferences, again, are not based upon decontextualized rules, but by a transaction between reader and text, where a reader's understanding of the text, personal experience, cultural knowledge, and stance contribute to inference-making.

Mental Models

Theories of discourse comprehension, built predominantly from studies conducted with expository and narrative texts, generally agree that a reader's mental model is comprised of multiple levels of representation (see McNamara & Magliano, 2009). One of the most widely accepted theories of comprehension, the *construction-integration* model (Kintsch, 1988), identifies three such levels: surface code, textbase, and situation model. The surface code includes the exact wording of the text. The textbase reflects mental propositions derived directly from the words of the text. Finally, the situation model includes information from the reader's prior knowledge necessary to construct a more elaborate representation of the text's meaning, including relevant inferences. Importantly, the surface code, textbase, and situation model are not separate representations but, rather, different dimensions of an overall mental model that are probabilistically represented depending on a number of factors (e. g., Graesser & Clark, 1985). To evaluate understanding of a text, researchers can assess the nature of a reader's mental model in terms of the quality of these different levels of representation. In the example from *The Flowers*, recalling that Myop was bending down to pick a rose when she saw the noose would reflect a textbase representation. If a reader recognizes that the noose must have come from a lynching, that would reflect a situation model level representation because the reader is using relevant prior knowledge about the history of racial violence to explain why the noose is there. While a reader would likely need to have some representation of the surface code and textbase to construct a coherent situation model, this development is not necessarily hierarchical or unidirectional. That is, a reader may be able to use information from one aspect of the representation to fill in the blanks of another. As discussed in detail below, there are potentially other levels of representation and other types of inferences that are relevant for mental model building when engaging in literary reading.

Mental models are dynamically constructed. They change and are updated during reading, but also can evolve after reading. Readers may forget information due to memory decay (Schmalhofer & Glavanov, 1986) or reread a text and

change the nature of their mental representations (Millis, 1995; van den Broek & Helder, 2017). In the classic *War of the Ghosts* study, Bartlett (1932) showed that, even without rereading, readers' memory of story details changed over time to be more consistent with their existing story schemas. A reader's mental model might also change after learning more about the context in which a text was written or after experiencing a different version of a text, such as a film adaptation (Donovan & Rapp, 2018; Magliano et al., 2018).

Both discourse comprehension theory and contemporary literary theory (e. g., Reader Response; Media Studies; Reception Studies) assume that a reader's mental model is affected not only by affordances in the text, but also by the particular task or context in which the text is being read, as well as by aspects of the reader (Iser, 1976; Snow, 2002; Rosenblatt, 1978). Thus, for two readers reading the same text, some features of their mental models will almost certainly remain the same (e.g, names of characters, basic setting information). However, variations in the readers' knowledge, goals, and motivations may yield different inferences that change the nature of their mental representations of the text (Magliano et al., 1999). In the same manner, a single reader might revisit a familiar text for a new purpose and emerge with a different mental model.

Modern discourse theories emphasize that reading is a goal-directed and active process (Britt et al., 2017; Graesser et al., 1994; Kendeou et al., 2011; Snow, 2002). In some cases, this goal may be well-defined, such as reading to write a paper for class. In other cases, the goal may be less well-defined (e. g., picking up a magazine to pass the time in a waiting room). These different reading goals lead readers to engage in different processes. For example, van den Broek et al. (2001) asked participants to read expository texts from *Scientific American*. The participants were instructed to either "read for leisure" or "read for study" and to think aloud as they read. Analysis of these think-aloud protocols revealed that participants reading for leisure generated more associative inferences (e. g., personal connections to text details), whereas those reading to study generated more causal inferences. Thus, the reader's goal plays a critical role in the nature and scope of inference generation. Similarly, Addington (2001) compared the discussion of Cisneros' *The House on Mango Street* in two settings: a college literature seminar and an education course structured like a book club. Students in the book club setting asked five times as many questions as did students in the seminar setting. Book club participants also made many more comments about personal experiences and referred less often to the text. Both studies highlight the fact that readers adapt their reading processes as a function of explicit or perceived reading goals.

In sum, theories of discourse comprehension assume that successful readers form coherent mental models by constructing inferences. However, these mental models are context and reader-dependent and they continue to change, even after reading.

What Is Literary Reading?

To discuss the processes involved in literary reading, we must first define literary reading and explain how it differs from other types of reading. Notions of literariness vary historically and culturally, and precise definitions of "literature" and "literariness" are contested (e. g., Fish, 1980; Miall & Kuiken, 1999). Rather than defining literary reading as "when one reads a piece of literature," we view literary reading as involving a particular reading goal or stance (Goldman et al., 2015; Rosenblatt, 1978). In literary reading, readers construct or derive meanings that go beyond the ordinary sense or "overt topic domain of the text" (Holyoak, 1982, p. 108). Literary reading explores, among other things, emotional responses, symbolic meanings, themes and worldviews, authorial craft, intertextual connections, and political and social implications of texts (Lee et al., 2016). When reading expository texts, a reader might have the goal of answering a question such as "How do tsunamis form?" or "What made Gandhi an effective leader?" Literary reading, on the other hand, addresses questions about human dilemmas such as "How could anyone sympathize with a murderer?" or "What can this character's disenchantment tell me about what it's like to be an adolescent?"

Consistent with discourse theories, the scope of literary reading in a given situation will be constrained by aspects of the text, the task, and the reader. A reader assigned a novel from the literary canon may read that novel in ways that leave various "larger" questions unaddressed. If a reader only seeks to understand the superficial gist of a plot, perhaps this reader has not engaged in literary reading. Alternatively, a person could choose to adopt a literary stance when reading an interview transcript or furniture assembly instructions, as those who collect "found poetry" do. For the average reader, though, such texts may do little to afford deeper meanings. Additionally, literary "reading" is not limited to poetry or prose. While this chapter will focus on text-based literary reading, other media such as film, music, graphic novels, and art can also be approached in a literary way. We will discuss how the processes involved in literary comprehension might vary across media later in the chapter.

Literary Reading and the Role of Interpretive Inferences

As discussed above, to meet the goals of literary reading, one must generate inferences to represent both a literal surface meaning as well as interpretive meaning(s) that go beyond the words of the text (Holyoak, 1982; Schraw, 1997). Discourse psychologists have proposed a multitude of inference taxonomies (Kintsch, 1998; Magliano & Graesser, 1991; Singer, 1988). However, most of them have focused on the construction of literal meanings, involving inferences that range from anaphor resolution (i. e., inferring the antecedent referent of a pronoun) to inferring relations (e. g., causal, spatial, temporal) across different texts. One of the most prevalent categorizations is the difference between *bridging* and *elaborative* inferences (Singer, 1988). Bridging inferences establish how ideas in a text are connected. For example, the excerpt from Walker's *The Flowers,* presented at the beginning of this chapter, includes the lines, "It was the rotted remains of a noose, a bit of shredding plowline, now blending benignly into the soil. Around an overhanging limb of a great spreading oak clung another piece." To understand how these sentences are semantically related, a reader would need to construct a bridging inference to conclude that part of the noose had broken off the tree and fallen to the ground. Elaborative inferences, by contrast, include extra-textual information. In our example, a reader might use context clues to activate additional prior knowledge to infer that the broken noose indicates the site of a lynching. While information from outside the text is being brought in to "fill-in-the-blanks," these inferences remain within the story world.

Beyond encoding these aspects of the situation model described by the text, literary reading involves additional types of inferences that are not always afforded by expository texts or simple story-driven narratives (Goldman et al., 2015; Magliano et al., 1996; Magliano & Graesser, 1991). Indeed, a common criticism of experimental studies of discourse comprehension is their overreliance on short, lab-designed *textoids*. While these texts afford experimental control, they may not provide opportunities for rich textual experiences like those encountered in authentic literary works (e. g., Bailey & Zacks, 2011; Claassen, 2012; Miall & Kuiken, 1994a; Rapp et al., 2011). Scholars suggest that literary works invite *transaction* between author/text and reader (Langer, 2010; Rosenblatt, 1978), where meaning is co-constructed as readers experience "a penumbra of private feelings, attitudes, sensations, and ideas" upon which they draw while building interpretations (Rosenblatt, 1993, p. 382). When engaged in literary reading, readers are more likely to generate interpretations that go be-

yond the story world. For example, while readers' mental models can represent information about the author's purpose in any type of text, inferences about authorial intention are more central to literary reading than other types of reading (Gibbs, 1999, 2001; Guy et al., 2018). Thus, literary discussions of *The Flowers* often note that text conveys a theme of the loss of innocence in providing a commentary on the harsh realities of racial violence. We refer to these "meanings" as *interpretive inferences* (Goldman et al., 2015; McCarthy & Goldman, 2015, 2019). Outside of Aesop's fables, literary texts do not usually explicitly state messages or worldviews; this information must be inferred. Thus, understanding how readers arrive at interpretive inferences is a key aspect of understanding literary reading.

The study of interpretive inferences affords not only a deeper understanding of literary reading, but also an opportunity to extend theories of discourse comprehension that have largely focused on the kinds of processes typically associated with reading expository and simple narrative texts. In the study of constructing mental models during literary reading, the following questions become relevant:

- How can researchers effectively and reliably assess interpretive inferences?
- Is interpretation a distinct level of representation outside of the situation model?
- Are interpretive inferences passive or effortful?
- *How* do we generate these inferences? *When* do we generate interpretive inferences?

In the following sections, we discuss researchers' approaches to these questions and some conclusions about the nature of literary mental model construction.

How Are Interpretive Inferences Measured?

Methods of assessing reading comprehension can be broadly categorized as online or offline. Online refers to assessments that are used *during* reading while offline refers to those that are used to measure readers' mental models *after* reading (for a review of these types of assessments in the broader context of discourse comprehension research, see McCarthy et al., 2018). Assessments that occur during reading attempt to capture the moment-to-moment cognitive processes involved in building a coherent mental model. Post-reading assessments can reflect differences that emerge during reading, but they can also be used to explore how the quality of a reader's mental model changes over time. While studies of literary reading can use relatively non-invasive processing measures

common to other areas of text comprehension, such as reading times (e. g., Hanauer, 1998), eye tracking (Burke et al., 2016; Mak & Willems, 2019; Xue et al., 2019), and (potentially more invasive) neural measures such as event-related potentials (ERPs; Chen et al., 2016; Jacobs, 2015) or fMRI (O'Sullivan et al., 2015), the study of interpretive inferences has relied largely on open-ended measures, such as think-aloud protocols, interviews, and essays.

In a think-aloud protocol, also known as a talk aloud or verbal protocol, readers are asked to verbalize their thoughts as they read. These utterances reflect the processes and strategies that readers engage in during reading (e. g., Magliano et al., 1999). Although asking readers to engage in this type of reflective verbalizing can be potentially disruptive (Branch, 2000; Nisbett & Wilson, 1977), research suggests that information gathered via think-alouds reflect natural reading processes (Magliano & Millis, 2003; Pressley & Afflerbach, 1995; Zwaan & Brown, 1996). Transcriptions of think-aloud protocols can be evaluated qualitatively for convergent themes (e. g., Kurtz & Schoeber, 2001; McCarthy & Goldman, 2019); parsed and quantified for the types of processes that emerge (e. g., Wolfe & Goldman, 2005; Peskin, 1998); or submitted to computational linguistic analysis (e. g., Graesser & McNamara, 2012; Likens et al., 2018).

Studies of literary interpretation have sometimes relied on comparisons between think-aloud protocols produced by experts and novices (e. g., Earthman, 1992; Graves & Fredriksen, 1991; Levine & Horton, 2015; Peskin, 1998; Zeitz, 1994). These studies reveal that literary experts typically reflect on specific language and stylistic conventions to contextualize the work, generate hypotheses about potential themes, and then return to the text to confirm, refute, or deepen these hypotheses. Experts make inferences that connect texts to their prior knowledge about authors, themes, and genres. In contrast, think-alouds produced by literary novices (students) reveal that they tend to closely paraphrase the text and rely on more domain-general meaning-making strategies. When inexperienced readers *do* make interpretive inferences, they often fall back on "happiness-bound" moral statements, such as "never give up," even when the stories offer negative outcomes and unsympathetic character portrayals that might suggest more pessimistic worldviews (Levine, 2014; Olson et al., 2010). However, the type of research question or the school-based discourses on which those questions draw may contribute to student readers' tendencies toward happiness-bound or moralizing interpretive inferences (Levine, 2018).

Another means of assessing readers' literary mental models is through post-reading interviews. Unlike think-alouds, post-reading interviews do not interrupt the reading process. Instead, the reader is asked to reflect on the reading once completed. These interviews can be retrospective, in which the reader simply describes what they believe they did during reading (Ericsson & Simon,

1980), or readers might respond to structured or semi-structured questions that probe aspects of the reader's representation that may not have been noted during a previous think-aloud exercise (Burkett & Goldman, 2016). However, a limitation to both think-alouds and interviews is that they are time consuming to collect, transcribe, and analyze. As such, these studies are often based on small samples that may or may not generalize to a wider population.

Two other common post-reading comprehension assessments are inference verification tasks (Royer et al., 1996; Wiley & Voss, 1999) and multiple-choice tests. These assessments are popular because they are quicker to collect and score than open-ended assessments. However, neither is well-suited to evaluating literary reading and interpretive inferences because they do not allow readers to build their own interpretations. These closed-choice assessments force readers to evaluate specific options provided by the researcher, and among those options, more than one might be a supportable literary interpretation (Langer, 2010; Levine, 2019). However, such post-reading assessments can help researchers assess whether a reader has a sufficient literal understanding of a story before researchers evaluate interpretive responses (e. g., McCarthy & Goldman, 2019).

Instead of forced-choice assessments, researchers interested in interpretive inferences sometimes rely on essays. Asking readers to write an essay is not only an effective means of data collection in the lab, but also a common and familiar educational practice. For example, McCarthy and Goldman (2015) asked participants to read the short story *Harrison Bergeron* and then compose an essay. The researchers developed a coding rubric that categorized each idea unit in the essay as paraphrase, text-based inference, or interpretive inference. Paraphrase statements reflect only information explicit in the text. Text-based inferences include the variety of inferences (e. g., predictive, causal) that a reader makes to understand the literal situation model of the story. In this story, the characters Harrison and the ballerina are murdered. To connect the events in the story, a reader might infer that they were shot "because they broke the law." Interpretive inferences, on the other hand, go beyond the world of the story to speak to the world at large. Statements such as "This story reflects how those who dare to be different are often stifled by the status quo" were scored as interpretive. McCarthy and Goldman found that readers who were prompted toward adopting a more literary-appropriate reading goal wrote less overall but included significantly more interpretive inferences than those biased toward summarization or given an ambiguous instruction. One limitation to this method is that it can only speak to the presence or absence of literary-appropriate interpretive thinking and not to the accuracy or quality of the interpretation. One solution presented by Levine and Horton (2013) is to score readers' inter-

pretations as "supported" or "unsupported" by evidence from the text (see also Graves & Frederiksen, 1991). However, given the dynamic nature of mental models and the personal nature of literary interpretation, such categories may not fully characterize the range of readers' responses.

While essays do not directly measure students' online reading processes, they are a useful means of assessing literary comprehension because they commonly involve more than mere recall of information in the text. Rather, they prompt the reader to use information in their mental model to integrate, reason, or apply information in new ways (e. g., Wiley & Voss, 1999). Writing about what one has read also relies on additional cognitive processes and composition strategies (Allen et al., 2014; Berninger et al., 2002), as well as on discipline-specific argumentation skills (Goldman & Lee, 2014).

A more novel method of studying interpretive inferences involves looking at student artwork about literary texts. For example, two ethnographically-oriented studies (Smagorinsky et al., 2007; Whitin, 2005) focused on students who drew pictures as part of the process of building interpretations of literary texts. The researchers analyzed both the artwork and students' talk about the artwork to develop a more contextualized understanding of students' interpretive responses. These studies found that students drew upon visual metaphors and personal connections to explain and enrich their literary reading.

Clearly, the ability to define and measure aspects of the interpretive process is a critical step in empirical investigations of literary mental models. While there remains no "ideal" way to assess interpretive inferencing, these studies offer a variety of viable techniques of assessing this complex phenomenon.

Is Interpretation a Distinct Level of Representation Within the Mental Model?

One question that has emerged in trying to understand mental model construction during literary reading is whether interpretive inferences are part of the situation model, as traditionally understood, or if they constitute their own level of representation. In a general sense, interpretive inferences may serve as "higher order" representations that link the situation model of the story world to the real world, as well as to other literary works that are connected via similar themes, genres, or authors (Goldman et al., 2015). Though the surface code, textbase, and situation model are the most common levels of representation discussed in discourse theory, other levels of representation have been posited. For example, readers can also represent information about the genre of the text

(Graesser et al., 1997), information about the specific task at hand (e. g., McCrudden & Schraw, 2007), and metadata about the source, credibility, or reliability of specific text(s) (e. g., Perfetti et al. 1999). Researchers have also proposed that information about authorial intent is represented in a separate level known as the pragmatic or communicative level (Claassen, 2012; Graesser et al., 1997; Kintsch, 1998; Magliano et al., 1996).

In some models (e. g., Graesser & McNamara, 2011), this communicative level is "located" hierarchically above the situation model, while in others (e. g., Kintsch, 1998), it is posited to connect the situation model to the surface code and textbase. These differences reflect potential variations in the role that interpretive inferences might play in the construction of mental models and would have different implications for how and when these inferences are made. Indeed, readers can construct interpretive meanings without a strong, literal situation model (McCarthy, 2015), which lends credence to the idea that an interpretive level may exist outside of the traditional tripartite model. However, there is a dearth of empirical evidence that speaks to this issue. Relations between interpretive inferences and other aspects of the mental model should become more specific as the body of research in this area continues to grow.

Are Interpretive Inferences Passive or Effortful?

A central question in the broader study of inferences is the degree to which they are generated with or without effort. Some text-based inferences may not require any effort and can be entirely supported by passive, memory-based processes (Albrecht & O'Brien, 1993; McKoon & Ratcliff, 1992). For example, when reading "John needed a new road bike. He went to the bicycle shop." the content words (nouns, verbs, adjectives, adverbs) and their combination (verb phrases) activate related ideas from semantic memory. Verbs such as "need," "went," and nouns such as "shop" activate knowledge that supports the proposition {*buy: john, bike*}. This proposition constitutes an inference (John went to the bicycle shop to buy a bike) that bridges the two sentences (e. g., explains why John went to the shop) and predicts a future action (e. g., John will successfully purchase the bike).

Memory-based inferences are clearly necessary, but likely not sufficient for most reading situations (Graesser et al., 1994). Additionally, many other inferences are constructed effortfully in service of establishing a coherent mental model (Graesser et al., 1994; van den Broek et al., 2001; see O'Brien, Cook, & Lorch, 2015). Reading with a goal to derive an interpretation of a literary work most likely requires similar effort. We argue that interpretive inferences, as the

results of a goal-directed process, are necessarily strategic. As we discuss in detail below, what may seem "automatic" for literary experts is more likely a reflection of skilled, effortful processing that, (for experts) has become routine.

How Do Readers Make Interpretive Inferences?

Formalists argue that meaning is inherent in formal features of the text. Alternatively, constructivists argue that literary interpretation is driven primarily by the reader. Empirical evidence suggests that the "truth" is somewhere in between – interpretive inferences emerge from affordances and constraints offered by text, context, and reader. This section discusses the impact of each of these factors on literary reading.

Affordances in a text. Literary authors write for an idealized audience, leaving markers and clues to help the reader make sense of the work (Rabinowitz, 1987). There is a large body of research in the study of *foregrounding*, the use of variations and devices in language to make parts of a text more important or striking (Miall & Kuiken, 1994b). These studies demonstrate that readers are sensitive to the presence of foregrounded information (Hoffstaedter, 1987; Miall & Kuiken, 1994b) and that altering these qualities affects the way that literary works are processed and evaluated (Dixon et al., 1993). For example, it is well-established that linguistic metaphors and related figurative expressions are salient prompts for eliciting literary interpretations (e. g., Culler, 2002; Miall, 1977; van Peer et al., 2007). Indeed, rich interpretations of metaphoric devices in literary contexts may frequently "emerge" via effortful inferential processes through which readers come to appreciate a range of potential meanings merely suggested by properties of the text itself (Gibbs, 2010; Vega Moreno, 2004; Wilson & Carston, 2006). Clearly, some texts involve a great deal of foregrounding and readily invite these forms of extended interpretation, while others do little to afford extensive interpretation. However, the presence of literary devices in a text does not guarantee that it will be read in a literary way.

Task-oriented reading. Reading is, at its core, a problem-solving activity (Black & Bower, 1980; Britt et al., 2017). To define the problem space, readers represent the context and task at hand in their mental model (Britt et al., 2017). For example, students in a literature course will likely be alert to the instructor who gives them a task that requires literary reading, their own expectations, and the intended outcome (e. g., a final paper). They also may be aware of other students in the course, especially when the task requires collaboration. Britt and colleagues (2017) posit that readers build a *context model* that represents this knowledge. They will also build a mental representation of the task at

hand. This *task model* contains a representation of the readers' goals, strategies to achieve those goals, and a representation of the progress made on attaining their goals. Both the context and task models are iteratively updated as progress is made towards the goal.

Different tasks yield different types of processing (McCrudden & Schraw, 2007; van den Broek et al., 1999, 2001), and different readers can adopt different strategies in response to the same task (McCrudden et al., 2011). Take for example, students who are given the instruction to "read a chapter from *Invisible Man* (Ellison, 1952)." One student may go home and generate only the most basic of inferences during reading to achieve a sufficient understanding of the plot. One may read the text through once for this basic understanding and then reread the text while highlighting main ideas. A third may read the text only once but stop to underline interesting linguistic features (foregrounded passages) and make notes about potential meanings. All three have "read the chapter," but they have engaged in very different processes and strategies.

Reader knowledge. Potentially the most critical part of literary reading is the reader's disciplinary knowledge. A common problem in literature classrooms is that students perceive the generation of interpretations as a mystical process, as though their teachers are pulling meanings out of thin air. In reality, instructors are disciplinary experts who have the knowledge and skills to construct these inferences in what only appears to be an effortless manner. These inferences are not automatic but *automatized* through exposure and practice.

Theories of discourse comprehension highlight the role of prior knowledge in developing a coherent mental model (McNamara & Kintsch, 1996; McNamara & Magliano, 2009), and prior knowledge is one of the strongest predictors of comprehension success (Dochy et al., 1999; Shapiro, 2004). Discipline- or domain-specific knowledge provides both more information to connect to and a better frame around which to organize incoming information (McCarthy et al., 2018). Research in domain expertise indicates that experts possess *more* knowledge and that their knowledge is more interconnected, which affords better comprehension (e. g., Alexander, 2004). Thus, an important question in this context is: what kind of prior knowledge is relevant for literary reading and, in particular, for generating interpretive inferences?

The types of knowledge that literary experts rely upon to engage in literary-appropriate comprehension processes can be grouped into two broad categories: epistemological knowledge and conventional or thematic knowledge (McCarthy, 2015). Levine et al. (2018) outlined the components of literary epistemic cognition (Table 1; see also Yukhymenko-Lescroart et al., 2016). Because experts recognize the interpretive nature of literary works, they are more likely to recognize the appropriate reading goal or *task-orientation* for literary contexts. They

are also more likely to recognize that there are multiple possible meanings to the same work, that there is value to be gained from rereading the same work, and, perhaps most importantly, that literary works speak to aspects of the real world.

Table 1: *Epistemic Cognition in Literary Reading and Reasoning*[a]

Components of Epistemic Cognition	Instantiations in Literary Reading
Epistemic aims	– Interrogate conundrums of the human experience – Examine relationships between content and form – Examine relations across texts
Structure of knowledge	Literary theorizing rarely assumes simplicity: – Multidimensional – Contextual – Probabilistic
Sources of experience and justifications of knowledge	– Personal knowledge and beliefs – Literary conventions – Language conventions – Literary traditions – Other texts, literary and nonliterary, including other's ideas on texts – Knowledge of authors and historical contexts – Philosophical, religious, political systems of thought
Epistemic virtues and vices	– Appreciation of literary texts and language as open to multiple interpretations – Dispositions to attend to nuances of language choice, language play, and text structure – Disposition to deal with uncertainty and ambiguity – Ideas about epistemic vices are rooted in debates over the nature of interpretation
Reliable processes for achieving epistemic aims	Reliable processes include: – Close reading – Argument – Consideration of multiple interpretations – Constructing or deriving patterns and tensions in texts – Considering emotional or affective responses as guides to interpretive salience and symbolic meaning

[a] This table is adapted from Lee et al. (2016).

Readers who adopt these literary epistemologies are more likely to generate interpretive inferences (Mason et al., 2006; Schraw, 2000). Encouraging novice readers to adopt this epistemological frame increases the likelihood of interpre-

tive statements both during reading (Burkett & Goldman, 2016) and after reading (McCarthy & Goldman, 2015, 2019).

The second type of knowledge that experts rely upon is knowledge of literary conventions, motifs, and themes. As mentioned above, a text may invite interpretation through particular forms of foregrounding, but literary reading will only occur if the reader has the appropriate knowledge to recognize these conventions and engage with them. When experts encounter stylistic variations in a text, they recognize the author's potential interpretive intent and engage in a closer reading to develop their interpretation. Novice readers are able to identify the "strikingness" or oddity of certain text features during reading (Miall & Kuiken, 1994b; Peskin, 1998; 2007), but rather than using them as a point of entry into the literary aspects of the text, they tend to simply reflect on their own confusion (Graves & Frederiksen, 1991; Peskin, 1998). Thus, these moments in which readers struggle to make meaningful connections between elements of the text (i. e., coherence breaks) and similar text features can serve as cues to experts, but not novices, to shift toward a more global, interpretive meaning (McCarthy, 2015).

In addition to knowing *what* to look for, an expert literary reader has knowledge of conventionalized ways of making meaning, such as locating a work within a genre or seeing it as manifesting well-known themes. Indeed, even when novices are given explicit instruction to interpret a literary work, they may only generate interpretive inferences if they possess knowledge of stylistic conventions in conjunction with knowledge of themes (McCarthy & Goldman, 2019). Warren (2011) asked poetry experts to read works within their specific subfield as well as outside of their subfield. When in their own domain of expertise, they were able to quickly develop meaningful arguments. In other subfields, experts were able to use foregrounded sections of text to identify the parts of the work necessary for meaning making, but indicated that they would need more knowledge about specific aspects of the genre and similar authors of the period to truly "make sense of" the work. Thus, the knowledge of both what to look for and what it might mean are critical in the construction of interpretive inferences.

In terms of mental model construction, experts are more likely to generate interpretive inferences because they have knowledge of relevant reading goals and strategies. They also have a rich interconnected network of relevant prior knowledge. For example, an expert might recognize a certain writing style and use that information to identify the author, which in turn, may activate relevant knowledge of other authors of that time period or relevant social or political issues and themes.

However, having explicit knowledge of literary rules may not be enough for a reader to construct a mental model that includes a coherent representation of the interpretive aspects of the text. Theories of skill acquisition suggest skills do not emerge overnight; rather, they develop over extended, repeated practice (Ericsson et al., 1993; Healy et al. 1993). The expert literary reader is not only a knowledgeable reader, but a skilled reader. For example, Levine and Horton (2013; 2015) found that students could be taught to leverage their natural abilities in assessing emotional valence as a path toward making interpretive sense of literary texts. However, they needed instruction and practice to develop this skill. Experts are experts not only because they have received explicit instruction about how to generate literary interpretations, but also because they have spent significant time practicing identifying and applying these rules in a variety of situations.

When Do Readers Construct Interpretive Inferences?

Beyond the question of whether or not interpretive inferences are generated is the question of *when* these inferences are generated. Knowing when these processes occur and when interpretive inferences are likely to emerge has important implications for the underlying mechanisms of literary reading as well as for the development of effective supports and interventions.

Research on literary expertise demonstrates that experts (readers with formal literary training, such as graduate students and professors) readily generate interpretive inferences during reading. In contrast, novice readers show little evidence of interpretive inferences during or immediately following reading (e. g., Graves & Frederiksen, 1991; Zeitz, 1994). However, when novices (usually high school or college non-majors) are prompted to engage in literary practices after reading, such as identifying a symbol, they are able to rely on their extant mental model to make these inferences (e. g., Burkett & Goldman, 2016; Narvaez et al., 1998). This suggests that relevant information is available in memory, but novice readers may often view potential interpretive inferences as irrelevant to the task of understanding or may fail to generate inferences across disparate pieces of information until prompted to do so.

Of course, experts and novices reflect two ends of a spectrum of the types of readers that routinely encounter literary works. Readers with differing amounts of experience, knowledge, and motivations will likely process various kinds of texts differently. For example, Kurtz and Schober (2001) asked avid readers (non-experts who self-reported an affinity for reading) to read works of microfiction. Their think-aloud protocols indicated that they entertained a variety of

potential meanings, showing evidence of online interpretive inferencing. Interestingly, many of the readers arrived at similar interpretations by the end of the text but demonstrated different inferences and processes en route to a final interpretation. This diversity of interpretive processes suggests a trajectory of expertise that merits further investigation.

Finally, consistent with theories of domain expertise (Alexander, 2004), experts not only have more knowledge of a domain, but also have more interconnected knowledge. Thus, relevant information is likely to be activated much more quickly given the density of knowledge available to them. This could explain why experts appear to make interpretive inferences "on the spot," whereas novice readers are less likely to do so without further prompting. Experts who are familiar with literary tropes are more likely to activate interpretive meanings in parallel with the literal aspects of the text. In contrast, a developing literary reader may need to read a passage several times and explicitly reason through context clues to develop an idea for what a particular symbol might mean.

Future Directions

The study of literary mental models discussed so far raises additional questions that researchers have only just begun to explore. Several such questions, described below, present exciting possibilities for continued research.

How Does Literary "Reading" Vary Across Modalities?

As previously mentioned, literature is not limited to text. Relatively little work, however, has been done to examine how literary processes emerge across other types of media (e. g., text, film, graphic narratives). Some research suggests that many processes that support mental model construction are universal (Gernsbacher, 1991; Kintsch, 1998; Magliano et al., 2001), while other work has identified important differences in the sub-processes relevant to specific narrative or literary contexts (Loughlin et al., 2015; Magliano et al., 2019; Magliano et al., 2013). For example, bridging inferences are likely to be media-general because they are necessary for establishing semantic and causal connections between narrative events. Indeed, evidence has shown that bridging inferences are generated not only when reading (e. g., Singer & Halldorson, 1996) but also when viewing visual narratives (Magliano et al., 2015). However, inferences in visu-

ally-based contexts (like film or graphic novels) may be supported by attentional and perceptual processes unique to visual media (Hutson et al., 2018). For example, in dynamic audio/visual media (e. g., film, theatre) emotion can be conveyed or emphasized through vocal inflections, musical underscoring, or staging in ways that are not possible in text-only or static media. Additional work is needed to understand how these processes unfold in different media and their consequences for interpretive products (see McConachie & Hart, 2006). In addition, research needs to consider how important differences in media are for offline mental models: though online processes may differ, do these lead to significant offline distinctions?

With respect to interpretive inferences, similarities and differences across media may vary as a function of a number of factors. While some conventions are quite general, others are genre and modality-specific (Rabinowitz, 1987). For example, film follows particular cinematic conventions (e. g., continuity editing) that help viewers perceive a particular sequence of events as coherent (Bordwell, 2013). Filmmakers may violate these conventions, though, to engender a particular reaction in the viewer. Such violations of film conventions could be seen as analogous to the idea of *disruption* or *deviation from the norm* as described in the analysis of literary reading (Rabinowitz, 1987), as well as consistent with findings about foregrounding as a way of calling attention to salient themes or elements in a text.

Consider, for example, the music video for Childish Gambino's *This is America* (Glover, 2018). The video opens with a man playing the guitar. The camera then focuses on Gambino dancing up to the man. When the shot widens back to the guitar player, his head is covered with a bag and Gambino shoots him in the head. In the rest of the video, Gambino dances through a warehouse that depicts scenes of violence and chaos. Developing a "literal" reading of this video requires basic visual processes and forms of bridging inferences to link one scene to the next. The video also requires listening comprehension processes to hear and understand the lyrics at a surface level. These multimodal processes may be different from those involved in text-only media (Magliano et al., 2013). The video for *This is America*, however, arguably gained viral status in part because of its literary merit. That is, viewers watched and rewatched the video to decipher its "hidden meanings." For example, after each shooting depicted in the video, the weapons are carried away on pillows while the victims are either left behind or dragged out of frame. Throughout the video, Gambino and a group of children dance happily, in stark contrast to the chaos around them. Viewers recognized the *juxtaposition* (a literary stylistic convention) between the treatment of guns and human lives and of violent death and happy dancing as a cue for interpretive inferences. One reviewer wrote:

> What's remarkable is that the dancers nailed each performance, and you could interpret that in one or two or three ways. One, they are clueless and dancing. Two, they have a clue and dance to keep from crying. Three, they are jamming for the camera or for social media video and know their dancing is a distraction, a salve or an invisibility cloak. Keep in mind the dancers were not shot, nor were they chased by the police. Given Glover's droll sense of realistic humor on FX's Atlanta, it would not surprise me if all three interpretations are correct, because often that is life in America. (Gibbs, 2018).

This reviewer (a writer, but not a literary scholar) explores the plurality of meanings. She also draws on her outside knowledge of Donald Glover's (aka Childish Gambino) other media to contextualize the work. To entertain these possible meanings, she generates bridging inferences to connect ideas from scene to scene, identifies foregrounded features, and uses knowledge of the current social climate to interpret Gambino's intended meanings. Thus, non-text media can invite a literary stance, much in the way a novel from the literary canon does. Indeed, making examples of literary practices found in popular and culturally familiar media "visible" in this way can serve as meaningful pedagogical gateway activities to help students engage in interpretive practices (Lee, 1995).

Given the possibility of literary interpretation in diverse modalities, understanding the similarities and differences across media is a key direction for future work. In one recent examination, Magliano et al. (2018) compared the processes involved in mental model construction across a graphic novel versus the film adaptation of the novel and demonstrated that viewers attend to different features across modalities. Participants noticed different types of discrepancies when they read the graphic novel first and then watched the film than when they watched first and read second. These findings suggest differences in the affordances of the two types of media (e. g., graphic novels afford self-paced consumption and effortful reflection in a way that a film does not) that shape how people construct representations of narrative events and themes in each medium. To our knowledge, the extent to which interpretive inferences may also vary as a function of media has been largely empirically unexplored, but it warrants attention (Magliano et al., 2013; 2019).

Computational Approaches to Analysis

Most research in the area of literary mental model construction has relied on qualitative analysis and expert judgments. In recent years, there has been a steep increase in the sophistication of natural language processing tools that allow researchers to capture multi-dimensional aspects of language (McNamara

et al., 2018). For example, Jacobs and Kinder (2018) used quantitative narrative analysis to analyze the linguistic features of metaphors used in literary works as compared to more everyday metaphors. They found that literary metaphors were distinctly different from everyday metaphors on a variety of dimensions such as word concreteness, sonority, and syntactic complexity. These tools not only identify the presence of specific words, but also the "quality" of the words used (Jacobs, 2017) and the relations between ideas (Landauer & Dumais, 1997; McNamara et al., 2014). Linguistic analysis can be used to evaluate the complexity or coherence of to-be-read texts (Jacobs, 2015; Jackson et al., 2016; McCarthy et al., 2008), but it can also be used to assess a reader's language when talking about a text (e. g., think-alouds, interviews, essays, discussions). Linguistic analysis of students' written or spoken products can identify processing strategies that readers use during reading (e. g., Magliano et al., 2002, 2011), evaluate the quality of a reader's mental model (Lintean et al., 2012), and allow researchers to test theoretical assumptions about text processing (Crossley et al., 2017).

For example, Balyan et al. (2017) examined whether linguistic features in a reader's essay could be used to detect evidence of interpretive inferences. Essays about two short stories were submitted to natural language processing tools that provided quantitative measures of various dimensions of language (e. g., lexical sophistication, syntactic complexity, cohesion between sentences). Using these linguistic features as predictors, a variety of machine learning algorithms accurately classified each sentence as an interpretive inference, text-based inference, or paraphrase of the story. As hypothesized by the researchers, degree of word concreteness (*elephant* is a more concrete word than *justice*) predicted interpretive inferencing, such that paraphrase and text-based statements were more likely to include more concrete words, while interpretive inferences were more likely to include more abstract words. The ability to classify these sentence types also relied on the overlap between ideas from the text and new information (i. e., integration of additional prior knowledge). This preliminary study demonstrates that idiosyncratic interpretations can still share linguistic features that distinguish them from other types of inferences. At the same time, finding the presence of interpretive content is not the same as finding high-quality or successful inferences, and the ability to evaluate inference quality is an important future challenge for computational approaches.

More broadly, computational analyses allow researchers to derive quantifiable differences from large sets of open-ended data that would otherwise be excessively time and resource intensive to analyze successfully. Such analyses can provide converging evidence about inference generation traditionally obtained through other methods but may also be used to find patterns in the proc-

essing of different literary genres and styles that may not be immediately apparent in other means of analysis.

Interpretation and Engagement

For many readers, the goal is not to interpret texts but to engage in something enjoyable. They may wish to immerse themselves in another world, learn about other people's perspectives, or simply admire exceptional prose. On this view, the effortful processes involved in the construction of interpretive inferences seem somewhat at odds with the desire for narrative immersion or absorption connected to overall enjoyment (Green et al., 2004; Langer, 2010; McConachie, 2008).

There is, however, some evidence that reader's evaluations of literary works can be tied to aspects of mental model construction. Elfenbein (2006) examined four reviews of Robert Browning's *Men and Women* in the context of examining goal-directed reading. Some reviewers, who appeared to focus on local coherence, found the inability to construct a literal mental model of the text to be frustrating and found little joy in the work, while others, who sought more global coherence, lauded the work as an aesthetic experience. While students might construct interpretive inferences because they "have to" for a class, it seems that avid readers would not engage in these types of processes if there were no incentive to do so. One potential explanation is that there is a connection between these processes and enjoyment. Indeed, Dixon et al. (1993) demonstrated that readers of literary works showed a *depth of appreciation* upon rereading that was not evident in popular fiction. Further, when language in the text was revised to be "less literary," this effect was attenuated. This suggests a link between these processes and evaluative experience that merits further exploration.

In a similar vein, Gerrig (1993; Gerrig & Wenzel, 2015) has documented how the products of basic inferential processes during narrative comprehension, such as bridging or predictive inferences, can function to evoke a wide range of *participatory responses* in readers that relate to their immersion and engagement with the text. Such "p-responses" include various evaluative or affective reactions (e. g., "Look out!") to actions or events that shape individuals' experiences during reading, such as feelings of suspense when a protagonist is unknowingly about to find herself in a dangerous situation. Although participatory responses on their own are not inferences in the classic sense, they almost certainly contribute to the ability of readers to engage with particular features of texts in ways that likely promote further interpretations.

Representing Affect in the Mental Model

The participatory responses identified by Gerrig (1993) highlight the role that reader's emotions can play in literary reading (see also Mar et al., 2011). One limitation of existing theories of discourse comprehension is that they have traditionally emphasized the role of so-called "cold" cognitive processes, such as memory retrieval and reference resolution. While researchers have certainly recognized the impact of affect on text comprehension, their focus by and large has been on understanding the cognitive mechanisms involved in reading. Only recently have researchers in discourse comprehension begun to dive into the complexity of examining the "hot" affective processes that routinely shape how people read or what people take away from a text (Bohn-Gettler, 2019; List & Alexander, 2017; Jacobs, 2015; Rapp et al., 2011).

When reading narratives, readers readily create mental representations of characters' emotional states (de Vega, 1996; Gerrig, 1993; Gernsbacher et al., 1992; Komeda & Kusumi, 2006; Komeda et al., 2013). However, representing a character's emotional state is not the same as feeling that emotion oneself. Although a reader's own emotions are not traditionally considered an inference, they almost certainly represent a kind of information that goes beyond what is explicitly described in the text. In addition, a reader's emotions, evoked either by external forces or by the text, impact the direction of attention and other cognitive processes related to comprehension. Thus, emotions play a potentially important role in literary reading, both in terms of how they impact mental model construction and how they might be represented in the mental model.

In contrast to discourse researchers, literary theorists have long discussed the importance of affective and aesthetic response in literary reading. For example, the study of foregrounding in literary aesthetics has demonstrated that linguistic variations in literary works can evoke particular kinds of emotional response (e. g., Hakemulder, 2004; Miall & Kuiken, 1994a). Some have argued that this aesthetic response is a crucial step toward the generation of interpretive meanings (O'Sullivan et al., 2015).

Other studies have explored the role of affect in teaching and learning about literary response. For example, a set of instructional interventions (Levine, 2014; Levine & Horton, 2013, 2015) asked students to attend to parts of a text that seemed particularly affect-laden or that led to particularly strong affective responses. Students then identified the degree to which those responses were negative, positive, or both, and reflected on and explained those responses. Students who were given this affective-evaluation intervention were more likely to generate interpretations of texts (as opposed to summaries) and

were also more likely to note negative aspects of a text as opposed to simple positive morals or "messages." Attending to the affective content of texts allowed these students to move from their own initial affective responses toward a more articulated emotional and evaluative response to literary works.

Of course, aesthetic emotions can be categorized beyond positive or negative (e. g., Menninghaus et al., 2019; Schindler et al., 2017). Indeed, investigating how these different types or dimensions of emotions that emerge from literary reading might impact the quality of a readers' mental model and, in particular, the nature of the reader's interpretive inferences is an important future direction for the study of relations between these hot and cold processes.

Recently, Bohn-Gettler (2019) proposed the Process, Emotion, and Task (PET) framework as a way to begin organizing the large array of findings about emotion and reading. This framework suggests that the relations between emotion and comprehension processes can vary as a function of (a) what processes in comprehension are being investigated (automatic or strategic, online or offline, bridging or elaborative); (b) what emotions are being explored (positive or negative, immediate or enduring, strong or weak); and (c) what tasks readers are engaged in (high stakes or low stakes; formal or casual; entertainment versus information). Thus, rather than simply stating that positive emotions are beneficial whereas negative emotions are not, the degree to which emotions affect mental model construction is again dependent on specifics of the task and reader. By providing a systematic view of the role of affect and affective response in text comprehension, the PET framework represents a promising step toward a more integrative understanding of how cognitive and affective processes may both promote the generation of interpretive inferences during literary reading.

Conclusion

In this chapter, we have discussed the nature of the inferences that readers generate when constructing a mental model during literary reading. In addition to the more basic inferences that readers generate to maintain a coherent literal representation of a text, literary reading also requires the construction of interpretive inferences that explore the "horizons of possibilities" offered by literature (Langer, 2010). Making these interpretive inferences requires the coordination of effortful and skilled processes that depend on aspects of the task, text, and reader. While there has been a steady growth in the research investigating these effects, we hope that this chapter will encourage continued growth and

inspire exciting new directions in empirical research in the study of literary mental models.

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