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The DRIVE Model of Reading: Making the Complexity of Reading Accessible

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Policy and practice suffer when understandings of reading are too simplistic, but a driving metaphor is used here to present a model of reading that is complex yet accessible.

What is happening during reading? What goes on in our minds? What influences what goes on in our minds? One view, known as the simple view of reading, posits that, fundamentally, there are two things going on: We are decoding words and we are "listening" (orally or silently) to, and thereby comprehending, the words we have decoded (Gough & Tunmer, 1986). Similarly, the popular rope model (Scarborough, 2001) is an extension of the simple view that suggests these same two processes (decoding and language comprehension) represent two multi-component strands of a rope that, when woven together, produce reading comprehension. Yet another view of reading, the four resources model, asserts that there are—or, at least, should be—four things going on when we read: decoding the texts and graphics, making meaning of what we read, using the meaning made for a social purpose, and critically analyzing those texts (Freebody & Luke, 1990). These are just three of many accounts of what is happening when we read.

There is value in relatively simple models of reading. Their simplicity makes them understandable and actionable. There are also drawbacks; for example, simple models can lead to oversimplified instruction or policy. Research points to many specific things that are happening in our minds during reading, as well as many specific influences on those mental processes. Having a model that incorporates more elements and their interrelationships could help the field develop more sophisticated understandings of reading and could more productively inform policy and practice. However, this aim is achievable only if the model maintains some level of accessibility and actionability.

Overview of the DRIVE Model of Reading

To develop a model that is at once complex yet accessible, sophisticated yet actionable, we have employed a metaphor. Metaphors can have great explanatory power (e.g., Lakoff & Johnson, 1980). In this case, we thought a metaphor grounded in a process more familiar and observable than reading might be just what is needed, and we decided to use the metaphor of driving to represent what happens during reading. We are not the first to use driving as a metaphor, however. For example, Adams (1990) invoked a driving metaphor, primarily to illustrate the central role of print in the reading process. Clay (2001) used the metaphor of driving to illustrate how reading is complex and requires coordination of an array of processes, which can be problematic, particularly for novice readers. Our use of the metaphor incorporates a broader array of processes and influences that occur in reading than have been incorporated into other popular

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models (see Figure 1). We first described our model in Duke and Cartwright (2019b), which we encourage you to consult for additional references for and explanations of model elements. We have made some adjustments and additions to the model since that time. In both cases, we call it the DRIVE model: Deploying Reading in Varied Environments.

It is critical that we note what the DRIVE model is—and is not—intended to do. It is not a model of reading acquisition. That is, we are not trying to explain how people learn to read; we are trying to explain what happens during reading. It is also not a model of reading instruction. We are not suggesting that each of the elements in the model needs to be taught to every student in every case, nor that the elements merit equal instructional weight. This said, in the Professional to Professional department column in this issue, "Implications of the DRIVE Model of Reading: Making the Complexity of Reading Actionable" (Duke & Cartwright, 2019a), we discuss specific implications of our model for instruction and policy. For the present piece, however, the purpose is to describe the model itself—to articulate what happens during reading.

PAUSE AND PONDER

- How do you usually conceptualize reading? Does your view of reading involve a few key processes or more?
- What does your reading instruction say about the way you conceptualize reading?
- How does the DRIVE model expand your understanding of reading?
- What aspects of reading are emphasized in your instruction, and what aspects deserve more attention?

Key Features of the DRIVE Model

In this section, we identify some key features of the DRIVE model that it may be helpful to have in mind as you read our more detailed description of the model, which follows this section.

The DRIVE Model Posits an Active Reader

The DRIVE model posits the role of the reader as actively managing and engaging in the reading process. Other models, such as the simple view (Gough & Tunmer, 1986) and the rope model (Scarborough, 2001), say little about how the reader manages to execute and integrate the many processes involved in reading. The DRIVE model, in contrast, frames the reader as the purposeful "driver" of the reading process and actively engaged with texts. Drivers choose to deploy the driving process, using vehicles, just as the reader chooses to deploy the reading process. Both readers and drivers manage a complex array of processes by using their executive function skills: higher order mental skills that enable us to manage our thoughts, feelings, and behaviors in order to achieve goals. Executive functions include working memory, inhibition (self-control), and cognitive flexibility and are central to reading (Cartwright, 2015). Although recent research has indicated a critical role of executive function skills in reading, DRIVE is the first model to ascribe a central role to these processes.

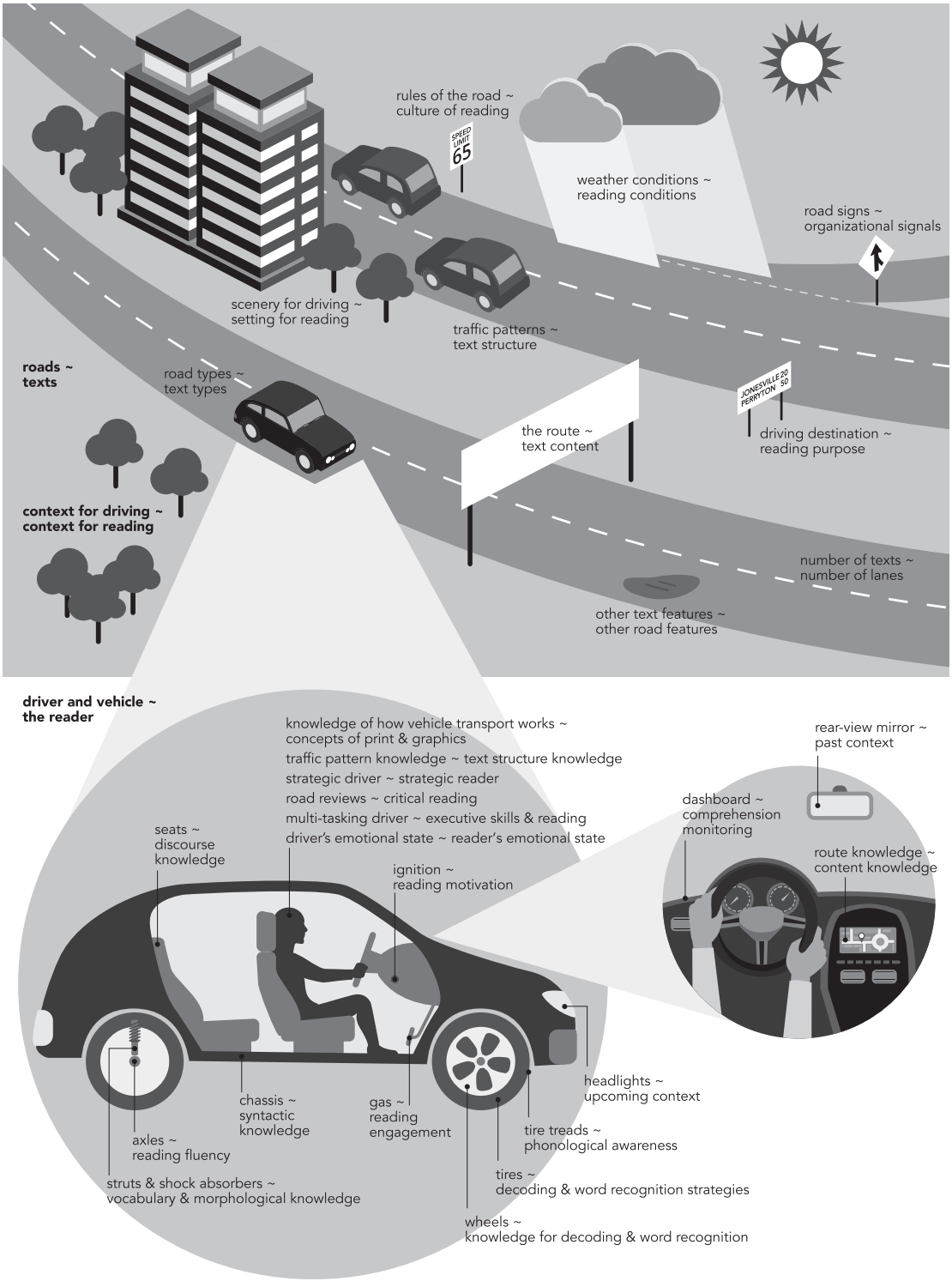
The DRIVE Model Includes Many Contributors to Reading

You might expect some of these many contributors to be in the model, such as decoding and comprehension strategy use. Others may not be expected, such as the mood of the reader and text features. To determine whether an element should be included in the model, we considered two primary factors. First, we considered whether there is evidence that the element is causally related to reading. We looked for experimental, quasi-experimental, or well-controlled prediction studies that suggest the element affects reading. Second, we considered whether the element consistently affects reading in every case of reading. For example, one could argue that having discussed a text with others would affect one's reading of subsequent portions of the text, but that element does not consistently affect reading in every instance of reading. Therefore, we did not include it as a contributor in the model. In that sense, the DRIVE model is a relatively generic or universal model of reading.

The DRIVE Model Posits a Strong Role for Purpose and Text

Some models of reading do not postulate a role for purpose at all. In our model, reading purpose, which we analogize as one's driving destination, plays a critical role. Similarly, many models of reading are atextual. They imagine the reading process as the same regardless of text. In contrast, as in the RAND Reading Study Group (2002) model,

Figure 1
The DRIVE Model of Reading: Deploying Reading in Varied Environments



Note. An earlier version of the model appears in Duke and Cartwright (2019b). Graphic design by Kindling Creative.

we view text as central to the reading process. We go beyond RAND in trying to include in our model specific aspects of text that influence reading, such as the text type and text content. Emphasizing purpose and text as we do, our model suggests that it is not reading in a vacuum but reading "of what for what" (Duke, 2005).

The DRIVE Model Emphasizes Both Cognitive and Sociocultural Contributors to Reading

Too often, cognitive views and sociocultural views of reading are separated, with scholars focusing their discussion on one or the other but not both. Purcell-Gates and colleagues have articulated in detail the case for integrating cognitive and sociocultural factors in models of reading acquisition (Purcell-Gates, Jacobson, & Degener, 2004) and instruction (Purcell-Gates, Duke, & Stouffer, 2016). We follow in that tradition in conceptualizing the reading process itself. We certainly include "in the head" processes, but we situate those processes in a place, with texts, and with reading purposes. We also explain how everything from concepts of print to the content of written texts is culturally constructed and influential in the reading process.

The DRIVE Model Allows for Interactions Among Contributors to Reading

The complexity of reading lies not only in the range of factors involved in the process but also in their many interactions. In the DRIVE model, we have tried to capture some of this interactivity. For example, in our model the route knowledge/content knowledge of the driver interacts with the content of the route itself/the text. A driver who has stronger knowledge related to the route will have an easier drive than a driver who does not; similarly, a reader who has stronger content knowledge related to the text will have an easier read than a reader who does not, not only in comprehension of the text but also in word reading processes and reading fluency.

Details of the DRIVE Model

In this section, we explore how the DRIVE model relates each element and process of reading to elements of processes of driving.

Reading Purpose ~ Driving Destination

Drivers drive for a particular purpose. For example, we may drive for enjoyment (e.g., a joyride) or to accomplish a task (e.g., pick up groceries). Each purpose may require different constellations of driving behaviors. Just like drivers, readers begin each reading task with a plan to understand text for a particular purpose—their reading destination, if you will—such as to read for enjoyment or to extract specific information. Each of these purposes requires a different constellation of reading behaviors. Indeed, research has found that reading purpose affects reading processes (e.g., Zhang & Duke, 2008).

Texts ~ Roads

Text Types ~ Road Types. The type of road on which we drive has a tremendous effect on driving. For example, muddy dirt roads make different demands on drivers than smooth pavement. Similarly, text type or genre has profound effects on reading comprehension. There are at least 18 ways in which reading processes differ for narrative and informational texts (Duke & Roberts, 2010). Just as some vehicles are more suited to some road types than others, some drivers are more facile with some text types than others.

Text Structure ~ Traffic Patterns. Roads differ not only in their type but in their traffic patterns—traffic lights, roundabouts, merges, and so on. Traffic patterns affect driving, and text structure affects reading. For example, like well-designed traffic patterns, well-structured texts tend to be better navigated than those that are not as well structured (e.g., Giulia Cataldo & Oakhill, 2000).

Organizational Signals ~ Road Signs. Drivers use road signs to help them anticipate and better navigate traffic patterns, such as lane shifts or a forthcoming pedestrian crosswalk. Likewise, organizational signals in text—things like headings, bold terms, and clue words/connectives (e.g., *next*, *suddenly*, *so*, *in contrast*)—facilitate reading comprehension (e.g., Lorch, 1989).

Other Text Features ~ Other Road Features. Other features of roads, such as rumble strips, potholes, and patches of ice, also affect driving, making it easier or more difficult for drivers to navigate their route. Similarly, readers may encounter some text features that make comprehension easier or more

difficult, such as varying decoding demands, familiar (or unfamiliar) vocabulary, graphics of many kinds, or inconsiderate or poorly written text that requires the reader to slow down, reread, and repair comprehension (e.g., Alvermann & Boothby, 1983).

Text Content ~ Route. A driver's actual route, often represented by the path in real time on the GPS, is the actual content of the drive that they take. Similarly, texts have content—topics they address, scenes they depict, and so on. Text content may be more or less familiar to the reader, as discussed later. It may also be more or less complex, with many aspects of complexity having been shown to affect reading processes and outcomes (e.g., Oakhill & Yuill, 1986).

Number of Texts ~ Number of Lanes. Sometimes, we need only remain in one lane to reach our driving goal. Other times, we need to manage multiple lanes, navigating between or among them as we make our way down the road. Likewise, readers may only need to read one text to reach their reading goal, such as when we read a single book for enjoyment. Other times, readers must integrate information across multiple texts to reach a reading goal, such as when a reader needs to research a topic using multiple informational texts, and uses distinct processes to do so (e.g., Davis, Huang, & Yi, 2017).

Reader ~ Driver and Vehicle

The driver and vehicle together represent the reader's headspace. Elements in this section exist on a continuum that ranges from the reading-specific (e.g., word recognition strategies) to more general but still influential contributors to reading (e.g., executive function skills). The DRIVE model makes part of the reader's headspace visible, via the vehicle, to better illustrate how reading interacts with text and context.

Concepts of Print and Graphics ~ Knowledge of How Vehicle Transportation Works. Drivers need basic information about how driving works in order to complete a drive successfully. For example, they need to know where to sit, how to hold a steering wheel, and how to start a vehicle. Similarly, readers must have basic concepts of print to read successfully, such as what books are for, how to hold a book, and where to begin reading. Readers' basic understandings of print and graphics are related to their reading ability (e.g., Lonigan, Schatschneider, & Westberg, 2008).

Reading Motivation and Engagement ~ Ignition and Gas. Driving requires ignition; vehicles cannot start without it. However, ignition is not sufficient to keep the car going down the road. Drivers must use gas to reach a driving destination. A lengthy or difficult drive may require more gas, whereas a short drive may require less gas. Similarly, motivation prompts readers to begin a reading task, but continued engagement is required for readers to persist, even in the face of challenge, to achieve their reading purpose(s). Motivation and engagement produce higher reading comprehension (Guthrie et al., 2004) and are strongly related to interest, which enables readers to persist toward reading goals, even when working with complex, challenging texts (Fulmer & Frijters, 2011).

Knowledge for Decoding and Word Recognition ~ Wheels. When drivers deploy the driving process to navigate a route, their wheels are what gets them down the road. Similarly, knowledge for decoding and word recognition enables readers to make their way through texts. As expected, research finds that phonics instruction supports reading comprehension development (e.g., Connelly, Johnston, & Thompson, 2001).

Decoding and Word Recognition Strategies ~ Tires. Wheels alone are not sufficient, though. Wheels cannot move a car very far without tires to apply their movement to the road. Likewise, knowledge for decoding and word recognition cannot get a reader very far in text without strategies that enable them to apply that knowledge, such as the strategies of chunking an unfamiliar word to decode it and decoding words by analogy, and instruction in these strategies improves reading comprehension (e.g., White, 2005).

Phonological Awareness ~ Tire Treads. Tires are only able to grip roads effectively if they have sufficient treads to do so, and decoding and word recognition strategies can only help readers inasmuch as readers have phonological awareness, particularly phonemic awareness. These skills enable such processes as blending phonemes when decoding and categorizing sounds while processing text (e.g., Bradley & Bryant, 1983).

Reading Fluency ~ Axles. The axles keep the driving process running smoothly and enable drivers to adjust to the contours of a road, speeding up when conditions are favorable and slowing down on rough patches. Axles represent reading fluency in the DRIVE model. Fluency enables readers to coordinate accurate and automatic word recognition processes and connect them to comprehension in part via prosody, or reading with expression, much as axles connect the wheels and tires to one another and the rest of the car. As expected, fluency instruction positively affects reading comprehension (e.g., Kuhn et al., 2006).

Vocabulary and Morphological Knowledge ~ Struts and Shock Absorbers. Struts and shock absorbers join the wheels and axles to the rest of the car and keep the car from bouncing down the road. Similarly, knowledge of words' meanings facilitates decoding processes and links them to the rest of the reading process. Vocabulary knowledge and strategies to infer words' meanings, as well as knowledge of and ability to analyze the meaningful components (prefixes, roots, etc.) of those words (morphological knowledge and strategies), connect word reading to meaning construction to support effective reading comprehension (e.g., Tong, Deacon, Kirby, Cain, & Parrila, 2011).

Syntactic Knowledge ~ Chassis. Although wheels and axles get a driver down the road, drivers need a structure to connect components of the vehicle together—the chassis. These supportive vehicle structures are akin to the syntactic (word function and order) knowledge that supports a reader in comprehending a text. Syntactic awareness is strongly related to reading comprehension and is amenable to instruction (e.g., Deacon & Kieffer, 2018).

Discourse Knowledge ~ Seats. Our experience in driving rests literally on the seats. Our experience in reading rests in part on our discourse knowledge (knowledge of texts beyond the sentence level). We rely on discourse knowledge to help us know what to expect and how to process different text genres (e.g., a fictional narrative text versus an informative/explanatory text), decontextualized language versus deictic language, texts in different disciplines (e.g., history versus chemistry), and so on. Developing readers' specialized discourse knowledge positively affects their reading comprehension (e.g., Greenleaf et al., 2011).

Text Structure Knowledge ~ Traffic Pattern Knowledge. Knowledge of the way that roads are laid out—such as the grid layout of cities such as Washington, DC—helps drivers navigate their route more successfully. Similarly, readers benefit from recognizing and navigating the structures of texts—narrative and informational (e.g., description, compare/contrast, temporal sequence)—when they read (e.g., Cain, 2003).

Content Knowledge ~ Route Knowledge. You have likely had the experience of driving somewhere without remembering how you got there. When a route is very familiar, it requires little to no conscious attention to navigate. Conversely, an unfamiliar route likely requires much of your attention—and you might still have trouble navigating it. Similarly, when readers have a lot of knowledge relevant to a text—including cultural and topical knowledge—they have a much easier time reading it (e.g., Bell & Clark, 1998; Priebe, Keenan, & Miller, 2012).

Reader's Emotional State ~ Driver's Emotional State. The emotional state or mood of the driver also influences the drive. A driver with a high level of anxiety—for example, about driving on icy roads—may drive more slowly and conservatively. A driver feeling pressured may take more driving risks and make more mistakes, and so on. Similarly, readers' emotional state may affect their reading. A number of studies have also shown that mood affects reading processes and achievement (e.g., Scrimin & Mason, 2015).

Critical Reading ~ Road Reviews. You undoubtedly have opinions related to driving—which routes are most efficient at which times of day, which roads are most in need of repair, and so on. Likewise, a proficient reader is not just a constructor of meaning but also a critic, asking questions such as, Was this a satisfying ending? Was the author clear in this section? Whose stories or perspectives were included, and whose were excluded? A considerable body of research examines critical literacy in relation to reading (e.g., Morrell, 2002).

Comprehension Monitoring ~ Dashboard. Drivers are continually active as they drive, checking gauges in the dashboard to ensure that driving is proceeding smoothly and that all parts of the vehicle are operating properly. Similarly, readers are most effective when they are continually active, monitoring the reading process to ensure that comprehension is

proceeding smoothly. When comprehension breaks down, as when a vehicle's dashboard indicates a problem, readers slow down, reread, or use some other strategy to repair comprehension (e.g., Language and Reading Research Consortium & Yeomans-Maldonado, 2017).

Strategic Reader ~ Strategic Driver. Driving is, or should be, a strategic process. A quick Google search indicates many recommended strategies for dealing with merging, blind spots, and other tricky aspects of the driving process. Reading should be similarly strategic. Good readers employ a number of active strategies to support understanding of text, such as predicting, making inferences, and visualizing what is encountered in a text. These and many other strategies can be taught, resulting in improvements in reading comprehension (e.g., Boardman, Klingner, Buckley, Annamma, & Lasser, 2015).

Executive Function Skills and Reading ~ Multitasking Driver. Both driving and reading, like any complex activity, depend on executive function skills. Executive function skills are higher order mental skills that enable the management of thoughts, feelings, and behaviors and are essential for success in goal-directed activities, from driving to a friend's house to comprehending texts (Cartwright, 2015). For example, drivers flexibly shift attention among elements critical for effective driving, just as readers actively shift attention between letter-sound information and meaning in text (i.e., graphophonological-semantic cognitive flexibility). Not surprisingly, students low in executive function skills have significant difficulty managing all the processes necessary for skilled reading comprehension, although these difficulties can be addressed with instruction (Cartwright et al., 2017).

Context for Reading ~ Context for Driving

Past and Upcoming Context ~ Rearview Mirror and Headlights. Good drivers are aware of not only what is happening where they are but also what is behind them (revealed through the rearview mirror) and what is coming up next (illuminated through headlights). Good readers are also aware not only of the meaning of text at that moment but where they are in the larger context of the text(s)—what they have read up to that point and what they anticipate coming next (e.g., DeLong, Groppe, Urbach, & Kutas, 2012).

Reading Conditions ~ Weather Conditions. Weather conditions affect driving in substantial ways. Slick roads or heavy downpours make driving difficult. Similarly, reading conditions affect the reading process. For example, noisy or distracting conditions, such as when music is present or when there is no natural light, negatively affect reading comprehension (e.g., Anderson & Fuller, 2010).

Setting for Reading ~ Scenery for Driving. Driving occurs in many different settings, and these contexts affect the nature of the driving task. For example, driving in a rural environment with little traffic—except the occasional farm equipment—places different demands on a driver than driving in a congested urban environment. Similarly, the setting for reading affects how we engage in the task. For example, we might read the same text differently in a religious institution versus a literature classroom (e.g., Crain, 2010).

Culture of Reading ~ Rules of the Road. Depending on where we drive, different rules apply to driving. For example, in the United Kingdom, people drive on the left side of the road, whereas in the United States, people drive on the right. There are also rules about who gets to drive (e.g., women are not permitted to drive in some places) and when they do so. Reading is also culturally influenced and even defined. For example, Murata (2007) documented that text interpretation processes were affected by whether or not the reader was from the Japanese cultural context.

Conclusion

Reading is incredibly complex and involves, and is affected by, a variety of factors. This complexity is difficult to convey to parents, policymakers, and other stakeholders. The DRIVE model provides a metaphor that likens reading to a familiar practice, driving, in order to demystify complexities of the reading process. DRIVE frames reading as an active, strategic process that is influenced by multiple, interacting internal and external factors, as is driving. The DRIVE model thus provides a view of reading that is accessible and actionable while preserving complexity.

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TAKE ACTION!

1. Reread and consult other resources as needed to build understanding of each component of the DRIVE model of reading.
2. Talk with a colleague or colleagues about the model, including its strengths and limitations.
3. Identify, with your colleague or colleagues, the components of the model you see as least understood and/or least acknowledged in policy and practice.
4. Challenge yourself to explain reading using the DRIVE model to a relative, friend, or neighbor who is not a teacher.
5. Read the department column "Implications of the DRIVE Model of Reading: Making the Complexity of Reading Actionable" (Duke & Cartwright, 2019a) in this issue of *The Reading Teacher*. Then, consider these questions:
   - What is at least one change that you could make to your practice based on the DRIVE model?
   - What is at least one step that you could take to deepen one or more policymakers' understanding of reading?

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- Bigelman, L.G., & Peterson, D.S. (2016). *No more reading instruction without differentiation*. Portsmouth, NH: Heinemann.
- Cartwright, K.B. (2010). *Word callers: Small-group and one-to-one interventions for children who "read" but don't comprehend*. Portsmouth, NH: Heinemann.
- Souto-Manning, M., Llerena, C.L., Martell, J., Maguire, A.S., & Arce-Boardman, A. (2018). *No more culturally irrelevant teaching*. Portsmouth, NH: Heinemann.
- Literacy Essentials: https://literacyessentials.org (This site provides professional development resources based on a relatively sophisticated view of reading.)
- TextProject: http://www.textproject.org (This site provides free texts for students, as well as professional development regarding choosing and using texts that support literacy development.)