

The Power of the Science of Teaching Reading for Making Inferences

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Abstract

Inferencing is a critical component of deeper level in reading comprehension. Teachers must instruct on how to make good inferences to fill in the gaps that are not explicitly stated in the text. By utilizing both local and global inferences, students would connect the context with their prior knowledge to deep dive into the author's hidden meaning. The study employed the key elements of the Science of Teaching Reading (STR) model, including explicit instruction, modeling, guided practice, and independent practice. The more students practice making inferences, the better prepared they will be for more complex texts. In assisting students with dyslexia on how to make inferences, remediation of connecting written words to oral conversations would help them gain a better understanding. Three books on dyslexia were employed in the study to demonstrate how to effectively teach inferences in the classroom. The study also added useful accommodations for students with dyslexia.

Keywords: Making inferences, Science of Teaching Reading, books on dyslexia, accommodations for students with dyslexia

Introduction

The term, “dyslexia” is no longer uncommon in the today’s society. More than 90 percent of American adults have heard of dyslexia and recognize it as a common difficulty (Frye, 2021). The IDA (International Dyslexia Association, 2021) estimates that about 15-20% of the American population experiences symptoms of dyslexia. IDA defines Dyslexia as a learning disorder that is neurobiological in origin and affects reading, spelling, and writing (International Dyslexia Association, 2021). Having dyslexia doesn’t mean an individual is totally incapable of reading. In fact, dyslexia exists on a spectrum and people with dyslexia struggle with language to varying degrees (WILDD, 2020).

Understanding students with dyslexia can be an essential learning objective in the classroom as young children appreciate the quality literature with a topic about dyslexia. Students with dyslexia may feel a sense of belonging when the class discusses about the experiences that they had kept for their lives. When the lesson makes connections with teaching reading comprehension strategies, the class would build a strong learning community no matter what difficulties they possess.

Among the major strategies in comprehension, making inferences is one of highest levels that students should master. When teachers introduce quality literature on dyslexia, the lessons for teaching inferences could accomplish multiple and meaningful purposes not only for helping young children understand about dyslexia, but also instructing useful strategies for making effective inferences.

In the study, the practical approaches for teaching how to make good inferences and relevant accommodations for students with dyslexia are discussed. Three children's literature, including the junkyard wonders by patricia polacco, the alphabet war by diane burton robb, and my friend has dyslexia by amanda doering tourville were introduced. The study seeks out the best strategies to practice making inferences as well as to offer useful recommendations for students with dyslexia for the joyful reading.

Literature Review

Texas Education Code (TEC) §38.003 defines dyslexia and related disorders in the following way: "*Dyslexia*" means a disorder of constitutional origin manifested by a difficulty in learning to read, write, or spell, despite conventional instruction, adequate intelligence, and sociocultural opportunity (Texas Education Agency, 2018, p.1). Dyslexia occurs in individuals of all backgrounds and manifests within a spectrum as the brain is unable to consistently link the written shape of a letter or word with the sound it makes (WILDD, 2020). In the classroom, students with dyslexia typically experience primary difficulties in phonological awareness and word reading, and ultimately have difficulties in reading comprehension and written expression (Texas Education Agency, 2018).

Inferences refer to the process of drawing a conclusion based on the available resources, previous knowledge and personal experiences (Mac Donnchaidh, 2021). Readers are required to make an educated guess by reading between the lines. They must use context clues from the text and activate their background knowledge to make successful inferences.

Making inferences can be a challenging task for students in general because it involves training to determine the meaning of unknown words that are not explicitly explained in the text. Students will be required to use their critical thinking skills to make a good inference. Making inferences for students with dyslexia is much more challenging because they originally had trouble reading the text and making personable connections is much difficult to achieve for these learners (Bailey, 2019).

Many researchers had reported major symptoms of dyslexic students as poor word recognition, decoding difficulties, reversing letters, difficulty remembering directions, etc. (University of Oxford, 2021; Shroff, 2021; Martinelli, 2021; Morin, 2021). Students that don't have dyslexia learn new words by breaking words down into smaller pieces and easy to work with chunks. However, students with dyslexia struggle with these basic strategies, causing them to have trouble reading, writing and spelling. Dyslexic students will also show signs in other social settings by not being able to keep track of multi-step directions, rules to games, and telling time. These students often struggle with low self-esteem (International Dyslexia Association, 2021).

Dyslexia does not mean they are not as intelligent but that they have trouble putting letters and letter-sounds together (Martinelli, 2021). Therefore these students need more time to process. Martinelli (2021) argued that with the proper accommodations, they still can become successful at these tasks. There are many accommodations that teachers can provide for students who are diagnosed with dyslexia. International Dyslexia Association (2021) reported that classroom accommodations make it possible for students to learn through full participation in classroom instruction. For example, assessment accommodations can be changed in assessment materials such as using large print or allowing them to type up. Giving the student the option for oral assessments, using multi-sensory instruction, and intensity of intervention by being pulled out of class for extra help can be alternative accommodations for dyslexic students (Martinelli, 2021). Without accommodations, an assessment may not be accurately measured the knowledge and skills of a student with dyslexia.

Morin (2021) presented very specific suggestions for teachers to introduce new vocabulary words prior to lesson, provide outlined notes and advance organizers, and offer visual and audio support to help the student with dyslexia understand written materials better. The teacher should ensure that the instruction, materials, and assessments are accommodated to each of students through all possible ways to get easy access. Offering colored strips or bookmarks can be a quick way to bring a sense of creativity of enhancing the students' ability to focus rather than becoming overwhelmed (Morin, 2021). Advance organizers would help organize the students' thinking and allow new material to be connected to prior knowledge. Breaking assignments into smaller parts would also help students who may take longer to comprehend information feel less stressed and produce more high-quality work (Morin, 2021).

Teaching Inferences to Children

Inferences are a foundational skill used for higher level thinking that facilitates readers understand complex text. Readers constantly make inferences during reading about setting, time period, characters, relationships, theme, unknown words, and author's perspective (Home Court Learning, 2020). Making inferences include gathering data from the passage and combining it with the student's existing knowledge. There are several activities to help strengthen inferring in the beginning stages. One is using pictures as examples and having the students break down the possible inference and their thoughts (Nook, 2021). Wordless picture books are also a great tool for this same process and students can learn that multiple inferences can be drawn. Creating visuals such as an anchor chart and graphic organizers are great tools to help students keep track of their thinking and reflect on how they made their inferences. (Home Court Learning, 2020). Currie & Cain (2015) argued that inferences are crucial for comprehension development and adequate vocabulary knowledge is a key to make inferences by associating working memory or long-term memory with students' ability to produce inferences.

Teachers should ensure to make the process as explicit as possible for students to gain a firm grasp of the concept (Mac Donnchaidh, 2021). Reading Rockets (2021) posits that teachers must provide direct instruction in making inferences. These suggestions are well aligned with the science of teaching reading model that is currently receiving hottest attention in education. According to Hasbrouck (2019), if students are provided with intensive, comprehensive and high-quality prevention, 90% to 95% of them can achieve literacy skills at or approaching grade level. The instructions must be systematic (easy-to-hard and foundational-to-applied) and explicit through demonstration, guided practice, and collaboration (Hasbrouck, 2019). Moats (2020) also demonstrated that teachers should apply science of teaching reading framework with more systematic, explicit and well-planned lessons in which students can be engaged to improve their reading comprehension skills.

Mac Donnchaidh (2021) presented practical strategies to employ before, during and after reading. To practice inferences before reading, the cover page illustrations, the title of the text, and blurbs can be utilized. For inferring during reading, rereading the challenging paragraph was suggested. After reading, students may reflect their pre-reading inferences and the author's intention for the confirmation. Mac Donnchaidh (2021) also presented practical activities, including riddles (Set riddles to solve), show & don't tell (Set them the task of identifying a character's traits in a story), give it to me straight! (Translate some sentences of inference into explicit statements), and the use of pictures (Tell stories through the skillful use of visual clues).

Most importantly, making the implicit explicit is the key to teach complicated topic of inferences, using the visual charts such as It Says... (Text Information), I say... (What I know from experience), And so... (My inference) as shown in Table 1 (Reading Rockets, 2021).

Struggling readers or students with dyslexia may have more difficulties at making inferences while reading, but with systematic and explicit instructions, they may benefit from this high-level strategy of making good inference (Cain, 2010, Hall, 2015).

Local Inferences vs. Global Inferences

Joseph, Wonnacott, and Nation (2021) distinguished local inference from global inferences as that local inferences involve information that is still active in working memory while global inferences draw on information that is not currently available to working memory but can be retrieved from their background knowledge. In other words, local inferences allow readers to connect information or words from multiple pieces of the text by using the information provided whereas global inferences allow readers to connect what they already know and information found in the text to make effective inferences.

In order to make successful local inferences, students can take text evidences one step further by finding clues from the text. Local inferences are based on the text, within and between sentences combined, bridging and linking ideas and concepts. The text provides connections between parts of the sentences and/or paragraphs. Readers will use the text to find clues to understand the meaning of unknown words. For example, for a word "tormented" in the story, *The Alphabet War* as in "After a while, he stopped listening. He pretended he was being held prisoner in the castle of an evil king, who tormented him with vowels." the reader can find a clue from the phrase "held prisoner." The teacher may role model for students to grasp on inferences by showing how to determine the meaning of the word using context clues repeatedly (The Stellar Teacher Co., 2019).

If this process is applied to the science of teaching reading model, the teacher may explain what students will be doing to make good inferences through explicit demonstration, modeling, repeated practice, and constructed feedback. Reading comprehension will not occur without inferences.

On the other hand, global inferences are to take the information in a text and use background knowledge to understand the author's hidden meaning. Readers are to fill in the gaps with their background knowledge to establish the connection between the text and the mental model (Smekens, 2017). In order to promote this technique, the teacher needs to generate critical thinking questions such as “*What inference can you make about how Mrs. Small was feeling when she was talking to Adam?*” in the story, *The Alphabet War*. Smekens (2017) introduced the silhouette strategy as one of the best approaches to teach global inferences. The silhouette strategy is used to put everything provided from the text on the outside of the head and place students' inferences inside to symbolize what the reader knows as shown in Figure 1.

Smekens (2017) suggested five steps to make an inference, using the silhouette strategy: 1) Read/View the text, 2) Read the question, 3) List related details, 4) Look for patterns or relationships, and 5) Determine what they mean. Through the teacher's step-by-step demonstration and the repeated practice with teacher's guidance, this technique would be the most effective tool to tackle this complicated strategy.

Teaching Inferences Using Books on Dyslexia

In the study, three children's literature, including *The junkyard Wonders* by Patricia Polacco, *The Alphabet War* by Diane Burton Robb, and *My friend has dyslexia* by Amanda Doering Tourville were employed to practice making successful inferences. Using the books on dyslexia, practical strategies were presented to teach local inferences and global inferences for the classroom teachers.

The Alphabet War

In *The Alphabet War*, the main character Adam says that his parents “hired a special teacher called a ‘tutor’ to help him learn to read during the summer” (pg. 6). By using what the text outlines, students can infer what a tutor means as that they are not in schools but are hired by schools to help their children. With the teacher's guidance, students may apply this strategy to other sections in the story. For example, have students determine the meaning of *flit* as in “*Everyone else in reading class could flit from word to word like hummingbirds.*” (pg. 14). Have them determine how the simile “*flit from word to word like hummingbirds*” lets them know exactly what the word could mean.

Global inferencing is not only inferencing using context clues from the text but also using one's prior worldly knowledge to determine the meaning of a word. Another example in *The Alphabet War*, Adam says that the letters on a page “*fluttered in his head like moths trapped in a jar*” (pg. 5). By drawing on worldly knowledge, students can infer what *fluttered* means, for a flying animal to flap its wings fast to get away from something. From a prompt question such as “How does the author display how Adam feels about not being able to read at the same level as his friends?” students would practice more in pairs or groups to produce the correct clues by combining the text clues to their background knowledge.

My Friend Has Dyslexia

To practice local inferences in the story *My Friend Has Dyslexia*, the teacher may select some of unfamiliar words from the story and encourage students to use context clues to figure them out. For the word, “dyslexia,” some questions may be addressed such as “What context clues helped you understand the word dyslexia in the texts? What symbol can you jot down in your notes to help you remember? In the word, “*self-esteem*” on page 10 of the story, the teacher may use the context clues to help students comprehend the text, using the image on the next page to infer ways on how to build up her self-esteem.

For the global coherence approach, the silhouette model can also be introduced by putting all pieces together to understand how Anna feels about having dyslexia. If a text shows a character was scared, students can use their own prior knowledge and experiences related to this feeling as well as clues in the text to infer why the character is feeling that way. To facilitate this process, guiding questions may be presented: What do I already know? How does the author feel about Anna's art? Why is the author saying about Anna? The class may use the “DID YOU KNOW?” box: “Did you know students with dyslexia may have a low self-esteem?” Then, the teacher's relevant prompts may be followed: “What information from the story helps you understand what dyslexia

means?" "What do kids with dyslexia struggle with?" At the end, students can create their own picture of the silhouette strategy as shown in Figure 7 below.

The Junkyard Wonders

From the word "brusque" on page 3 in the story *The Junkyard Wonders*, students need to check what they already know about the teacher in the story to figure out with this unknown word. Using the text clues, students may find out that the main character might think that her new teacher was not very nice or could be mean. To make an inference with the word, 'defy' (pg. 12) in the text, "*We are going to rebuild it into something bigger, better... something wonderful...something that will defy gravity itself,*" students may use contextual analysis to decipher the definition of the unfamiliar vocabulary. They may practice them in small groups and as a class with teacher's guidance by looking for hints in the text or by using the picture clues to aid them in the thinking process.

Some of guiding questions for the small group discussion may include: "*How does the main character feel about her new school and classmates?*" "*What did her dad want her to do about moving schools?*" The groups would look for context clues from the text such as "*My heart sang. No one would know I was in a special class. I finally burst into tears. I tried to be brave and not let them know how sad I really was*" (p. 2). "*You are not a quitter. If the class doesn't get better, I promise I'll send you back to California*" (p. 6). Combining these clues with their prior knowledge, students may be assigned to an independent task of reading different pages on their own and practice more inferences.

Accommodation for teaching inferences to students with dyslexia

Students with dyslexia face a lot of challenges. Teachers can help accommodate these students by giving them specific instruction to fit their needs. Students with dyslexia are capable of becoming skilled readers if they receive the help they need. To discover what strategies work best, the teacher should employ a variety of different approaches. Some of suggested strategies include:

- Reread the selection, choral reading, provide a big text, use colored strips of paper or a bookmark, have the book read aloud to them (Rockin Resources, 2008).
- Offer extra time to complete tasks, assist with taking notes, and provide taped tests or use alternative means of assessment, clarify the instructions and provide a glossary (International Dyslexia Association, 2017).
- Teach how to make inferences in their daily lives, rather than just a school setting. To practice the global inference, use speech-to-text software to record their answer and prior knowledge for the inside of the silhouette strategy. It will allow the student to talk about their answer instead of having to write it down and potentially stress (Fearn & Turner, 2021).
- Use audio book for the texts in class. So, students can hear about the story and gather information instead of being so focused on trying to read the text (Martinelli, 2021).
- To build on their prior knowledge, a variety of graphic organizers such as flowcharts or sticky note thought process activities may be addressed to help students visually see the connection of their prior knowledge and the text (Morin, 2021).
- Let the learner buddy up or work in a group to talk about how the book relates to real life (Rockin Resources, 2008). This will facilitate a discussion about why the junkyard learners were treated poorly and the stereotype/prejudice that comes along with being an exceptional learner in the story, "*The Junkyard Wonders*".
- Use explicit teaching procedures, simultaneously combining verbal and visual information, employing balanced presentations and activities, and emphasizing daily review (International Dyslexia Association, 2017).
- Present visual displays on an overhead or handout, along with verbal information for the best outcome (Nook, 2021). There must be a nice balance between oral presentation and participatory activities. Daily review of previous lessons can help students connect new information with prior knowledge.
- Employ structured literacy instruction and the concepts of the science of teaching reading (STR) model (International Dyslexia Association, 2017). The STR model promotes teaching inferences through explicit explanation, modeling, guided practice and independent exercise.

With sufficient practice and effective accommodations, there is a hope for students with dyslexia to feel a sense of success during reading.

Discussion

Making inferences are used at all levels of education. When students make inferences, it means that they are using the information that is given or that they have already learned to use. Once a student has made an inference, they have engaged in the most powerful part of the process. Local inferencing is more focused one specific paragraph or sentence to figure out unknown words or contexts while global inferencing concentrates on the text as a whole and what the students can extract from it based on their prior knowledge.

Direct, explicit instruction in making inferences is essential to students' success in reading comprehension. Students should be explicitly taught through thinking aloud demonstration during the "I do it" phase of instruction. For example, while you are reading, pause when there is something that is being inferred and point it out each time by modeling think-alouds. Teaching to make good inferences should begin with the direct instruction followed by the guided practice and eventually help students apply the strategy on their own (Mac Donnchaidh, 2021, & Reading Rockets, 2021).

Students with dyslexia have a unique condition that requires teachers to use special instruction accommodated to fit their needs. These learners may struggle more with making inferences than typical children. For local inferences, teachers can make comparisons between written text and the inferences that occur in oral conversation. Throughout teaching inferences, they may need step-by-step instructions so that they may be able to physically see the process and are able to develop a deeper understanding of the material. Making appropriate inferences is vital to reading comprehension.

The study discussed strategies to enhance teaching inferences, along with accommodations for students with dyslexia. Students should be taught how to treat everyone regardless of their reading difficulties. Teachers should ensure that their students with dyslexia will never feel that they are unable to accomplish a task simply because of their differences. The author does not always provide all the information needed. Using different paths of teaching between local and global inferences, the teacher should be very careful in selecting challenging words and phrases as well as bringing necessary background information for students to make inferences. The Silhouette Strategy is a great way for students to be able to visualize what they learned from the text and how to access their prior knowledge and putting their inferences down on paper. Dyslexia books can be very beneficial in the classroom not only for students with dyslexia to know that they are not the only ones that have trouble reading, but also to inform other students that it is not their fault they can't keep up.

Providing a direct and explicit instruction is one of effective ways for teachers to employ by explicitly explaining what they are teaching, guiding students through the process, and assessing understanding of making inferences to promote better comprehension skills. With the proper instruction, any student can learn to read and write without further problems. Based on the assumption that everyone deserves an equal opportunity, the teacher should expose a variety of books for each learner's unique needs and provide multiple means of engagement, representation, and expression for all learners to receive an equitable education at the risk-free environment. We all can enjoy higher level skills of making inferences joyfully.

Figure 1: It Says...I say...And so...

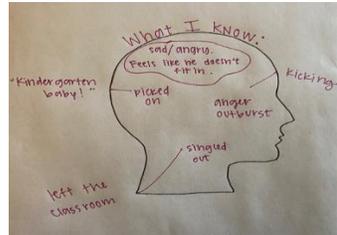
Question	It Says ... (Text Information)	I say... (What I know from experience)	And so... (My inference)
Step 1: Write the question.	Step 2: Find the information from the text that will help answer the question.	Step 3: Think about what you know about the information.	Step 4: Combine what the text says with what you know to come up with the answer.
<i>What do you infer from the text?</i>	<i>The fireman went and put out the house fire.</i>	<i>Fires are extremely hot and dangerous. The family needed to evacuate.</i>	<i>The fireman made sure nobody was in the house and had their turnout gear on.</i>

Figure 2: Five Steps to Make an Inference



Source: Smekens (2017)

Figure 3: The Silhouette Strategy I (*The Alphabet War*)



Source: Hartlyn Smith (2021)

Figure 4: *The Alphabet War*

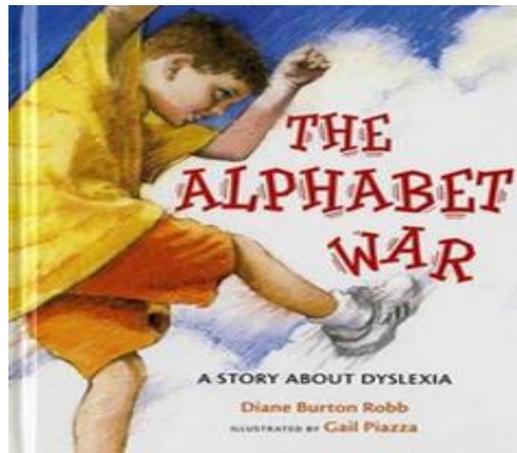


Figure 5: *My friend has dyslexia*

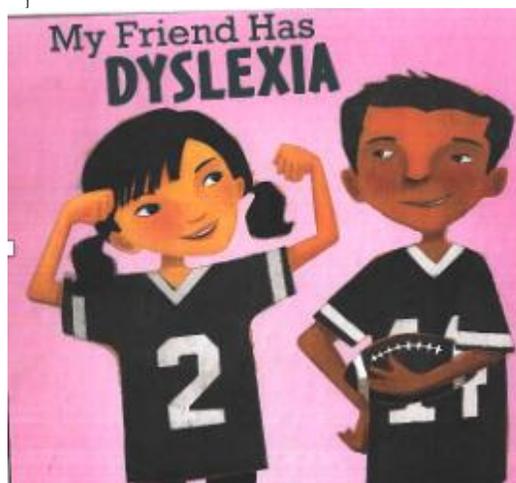
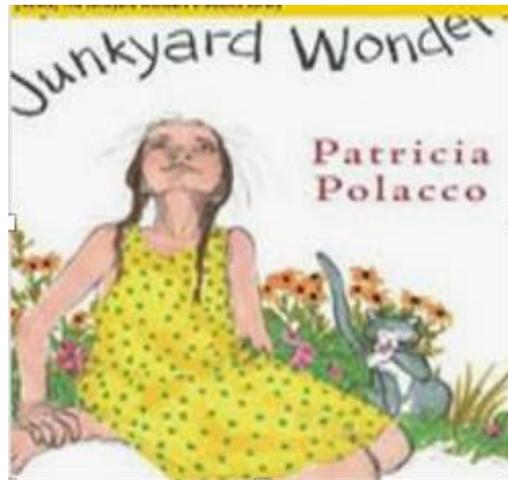
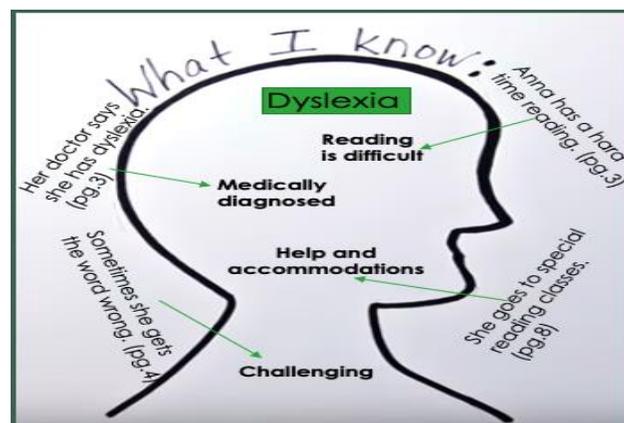


Figure 6: *The junkyard Wonders***Figure 7:** *The Silhouette Strategy II (My Friend Has Dyslexia)*

Source: Ashley Blackwell (2021)

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