Chapter 13
Using Visualisation and Imagery to Enhance Reading Comprehension

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Abstract Reading comprehension is a dynamic process that requires readers to construct meaning while they are decoding text. During the reading process readers do not normally retain verbatim text information but develop other, more flexible knowledge structures. Skilled readers do this by constructing a mental model incorporating both visual and verbal information in the form of a cohesive representation of the meaning. The construction of a mental model is formed by the integration of the reader's prior knowledge with the text structure or story content. For example, good readers tend to make bridging inferences by incorporating their own relevant background knowledge to fill in the gaps when important information is not given in the text. When readers are taught to visualise story events they are able to make appropriate inferences because visualising enables them to draw on their own prior knowledge and life experiences. As readers visualise while reading they become more engaged with the text, enjoy what they are reading, and often imagine themselves in the story. Imagining story ideas during the reading process links information in working memory and makes the encoding and recall of information more efficient. This chapter discusses how visual imagery techniques such as drawing, manipulating objects, forming mental imagery, developing characterisations, and using story structure can improve reading comprehension performance.

Keywords Visualisation • Imagery • Cognition • Comprehension • Reading strategies • Memory • Literacy • Language

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Introduction

In recent times, the advent of information technologies and the Internet with its multimodal and non-linear structure has prompted many to question the nature of literacy in Western societies. Kress expresses this notion in the following quote:

> It is no longer possible to think about literacy in isolation from a vast array of social, technological and economic factors. Two distinct yet related factors deserve to be particularly highlighted. These are, on the one hand, the broad move from the now centuries-long dominance of writing to the new dominance of the image and, on the other hand, the move from the dominance of the medium of the book to the dominance of the medium of the screen. (Kress, 2003, p. 1)

Thus, the two modes of writing and the image are each governed by separate logics, and have distinctly different affordances. The organisation of writing, while still depending on the organisation of speech, is governed by the logic of time. In contrast, the organisation of the image is governed by the logic of space and places visual elements in a simultaneous arrangement (Kress, 2003). Consequently, many theories of reading reflect the old-world conceptualisation of print as a linear, sequential, and time-ordered logic. In contrast, learning theories that have focused on imagery have often been regarded as nonscientific and belonging to the world of fantasy or mysticism.

Graphic novels and comics have been popular since early last century, but it is only recently that they have been accepted in education circles as appropriate for children to read. In earlier times it was assumed that the graphic representation simplified the literacy elements and the quality was thought to have been inferior to that of the standard text-based novel. Rather than simplifying the literary elements of texts they are now considered to be somewhat more complex. For example, interpreting a character's facial expressions or nonverbal gestures from illustrations or making inferences from visual cues such as colour, perspective, line, etcetera can be quite complex (Thompson, 2008). When reading multi-modal texts the brain has to processes a multifaceted mix of verbal and nonverbal semiotic codes simultaneously to integrate them and comprehend a narrative.

It follows that traditional theoretical models of reading have been dominated by the logic of print, and this has led many to assume that the teaching of reading comprehension is as straightforward as merely teaching sound-based word recognition and word decoding. Thus, students have traditionally been taught to comprehend text by learning and practising a small set of discrete decoding strategies. These strategies have usually been taught in distinct and disconnected reading comprehension lessons that have no relation to the content of classroom themes or topics. However, comprehension is not a skill like decoding that can be mastered in a relatively short period of time, but is a process that often takes years to complete (Catts, 2009).

Reading and Learning Theory

There have been a number of theories of reading that have influenced how reading is perceived but have tended to narrow the focus to a bottom-up or top-down approach. For example, LaBerg and Samuel's (1974) theory of reading is a bottom-up approach that concentrated on print and word meanings. In contrast, schema theory (Bartlettt, 1932) was a top-down learning theory that placed more importance on the reader's prior knowledge to construct meaning. This theory assumed that existing knowledge representations are abstract and amodal, existing in a state that has no objective reality. Although not being directly associated with the sense modalities, this model laid a foundation for understanding how learners assimilate new information into their existing mental structures. The simple view of reading (Gough & Tunmer, 1986) is a theory of reading that attempts to conceptualise reading comprehension as the product of both bottom-up and top-down processes: word decoding and listening comprehension. However, these and other similar theories do not adequately explain how mental imagery contributes to the cognitive processing of text information. Thus, few reading theories mention non-verbal aspects of thought, such as mental imagery or affect (Krasney, Sadoski, & Paivio, 2007). It can be asserted that no matter whether they are top-down, bottom-up, or a combination of both they are dominated by a linear, sequential, and time-ordered logic.

At the heart of the reading comprehension process is the construction of a situation model or a cohesive mental representation of the complex meaning of the text content. Kintsch and van Dijk (1978) were influential in developing the notion of the mental modelling as a dynamic comprehension building process that is partly determined by the interaction of the reader's prior knowledge, the text structure, and the story content. Situation models generally do not retain the verbatim text-based information but support more flexible and abstract knowledge structures, such as propositions that link in to build local and global understandings of text. Kintsch (1998) extended this notion by developing the construction-integration model, which allowed for a more flexible integration of information during the thinking process. Once again this model was a verbal/time- and language-based theory that did not include the multimodal, verbal-non-verbal mental representations that have the potential to capture the richness of real-world or imaginative situations.

It is asserted that reading is a more complex and interactive process that includes not only the verbal/time aspects of comprehension but also the visual/spatial modality as well (Krasney et al., 2007; Woolley, 2006a, 2006b). It has been asserted that only theories that deal directly with both these distinctions will be sufficient to develop a meaningful understanding of the reading process (Paivio & Sadoski, 2010). The dual coding theory (Paivio, 1986), on the other hand, is a theory that assumes that all thinking is composed of the activity of two mental codes: a verbal code that

uses language and a non-verbal code that uses mental imagery (Sadoski, Goetz, & Rodriguez, 2000). This is an important notion because mental imagery can be used to depict visual representations of text, pictorial material, local and global events, representations that show part/whole relationships, topographical associations, classifications of objects, abstract representations, and symbols to portray relationships or interaction. This theory integrates the visual/spatial aspects of meaning, while subsuming the basic features of the earlier-mentioned knowledge-based top-down or print-based bottom-up models (Sadoski, McTigue, & Paivio, 2012). For example, imaginative representations will contribute strongly to, and reinforce, word meanings and language performance (Paivio & Sadoski, 2010).

This dual coding hypothesis is largely supported by another theoretical construct known as working memory that conceptualises how information is processed in the mind of the learner (Baddeley & Hitch, 1994). The theorists proposed that a central executive facility allocates attention and information for storage or processing and also temporarily activates information from long-term memory in order to link to the newer incoming information in memory (Alloway, Gathercole, Willis, & Adams, 2004; Gathercole, Alloway, Willis, & Adams, 2006; Swanson, Howard, & Saez, 2006). This theory proposed that visual and verbal information is stored in a separate verbal and visual subsystem referred to as the phonological loop and the visuo-spatial sketchpad. A later version by Baddeley (2000) included a third subsystem called the episodic buffer, possibly used to link the verbal and visual modes of thought. This addition may accommodate the notion of movement by combining the time and spatial aspects of the visual and verbal subsystems.

This notion is given impetus by other theorists, who recognise that learners have at least three modes of thinking. They generally propose that people attend selectively to elements in their learning environment that support their preferred learning style and will favour some learning activities and materials over others. A learning style preference refers to the oral, imagery, or kinesthetic dimension of cognition that influences the learning style of the individual (Kozhevnikov, Hegarty, & Mayer, 2002).

Thus, both the dual coding theory and the Baddeley working-memory model assume that reading and thinking activity incorporates a combination of more than one mode. When readers utilise the visual and verbal modes, working-memory efficiency will be improved by the reduction of the cognitive load associated with the mental modeling process (Joffe, Cain, & Maric, 2007; Sadoski & Willson, 2006; Woolley & Hay, 2004). Moreover, a number of researchers have also claimed that students have improved in reading comprehension when visual and verbal techniques have been applied during reading lessons (Gambrell, Kapinus, & Wilson, 1987; Pressley, 2002; Yuill & Oakhill, 1991).

Levels of Processing

Dinsmore and Alexander (2012) reviewed the research on how readers process text while reading. They found that most researchers generally agreed that reading is a thinking activity that takes place on at least two different levels simultaneously.

They proposed that when good readers read they engage with the text at a surface level and also at a deep level of processing simultaneously. These two processes are essential for effective reading comprehension to take place. However, reading involves more than decoding and interpreting a written message; it also involves an analysis of the reading process itself and how the message will impact the reader's view of the world. Both the dual coding theory (Paivio, 1986) and the construction-integration theory (Kintsch, 1998) support the notion of three interactive levels of cognitive processing (Sadoski et al., 2000). For example, correct phonological recoding is conducted at the text or surface level but is also dependent upon comprehension at a deeper level because of pronunciation. Comprehension is also dependent on context and background knowledge. Comprehension takes place at an even deeper level that involves one's beliefs, attitudes or feelings towards a particular activity or text, and may affect the way in which the reader decodes the surface features of the text and also the ability to combine knowledge structures below this surface level. Thus, reading is an interactive process and operates simultaneously at all three levels (Sadoski & Paivio, 2007). In the following section these levels have been conceptualised as stepping forward, stepping into, and stepping back.

Stepping forward: At the surface level readers decode the bottom-up or surface or physical features of the text itself. They generally do this by focusing on the written message by identifying letters, clusters of letters, words, and clusters of words in order to follow the text discourse. As they do this they often sub-vocalise or speak the written words in their heads. This process is referred to as a stepping forward. In stepping forward the reader must process larger amounts of text in order to decode the message more efficiently because working memory has a limited capacity (Daneman & Green, 1986; Just & Carpenter, 1992) and too many small bits of information can stifle this stepping forward process. Thus, for reading to progress well the reader must touch as few bases as possible by sampling some of the surface features of the text and filling in the missing details from their long-term memory. This recognition process eliminates redundancy and ignores the non-essential information that would clutter their working memory. The surface information is processed and retained in memory not as verbatim strings of symbols such as letters, words, or strings of words, but as small chunks of meaning called propositions. Many children step forward with their reading but many do not go any deeper than merely decoding the surface features of the text.

The stepping into of text processing operates when readers enter a deep level of or top-down processing. This is the mental space where information is transacted and transformed. For example, the propositions made during the stepping forward are transformed by the reader's ability to develop inferences while reading. Usually inferences are formed when readers link ideas from one part of the text to another or when bridging inferences are created by combining existing information from the reader's own background knowledge to fill in the gaps. This mental activity is often required because texts would be too long and copious if all the information were to be supplied. Therefore, authors naturally expect that readers will draw from their own world experience.

At this level the skilled reader is involved in coherence building in order to construct meaning. In doing so the reader enters into a delicate balancing act whereby

the attention resources are allocated and re-allocated in order to make meaning. This process it is characterised by the shifting of attention from a focus on the incoming information, sifting the information, holding onto some information, and letting go of other extraneous information. The reader uses this sifting process to make inferences by assimilating the new knowledge with their background knowledge. At times this will be under the conscious control of the reader and at other times it will take place unconsciously and automatically (Catts, 2009).

Skilled readers are more likely to be engaged readers who actively make inferences and form mental situation models of text passages by incorporating both imaginal and verbal background knowledge to make sense of the implicit information found within texts (Pearson & Johnson, 1978; Snow, 2002; Stull & Mayer, 2007). It can be asserted that, when visual and verbal mental processes are linked in this way children will be more engaged in comprehending texts because visual imagery enables them to store and use their prior knowledge more efficiently while processing new information in working memory. Thus, successful comprehenders tend to be imaginative readers who use non-verbal as well as verbal language.

Stepping back is a third level of processing but is not often included in discussions about levels of processing. However, this is possibly the most important component of information processing. The term stepping back implies that readers step back, or change their perspective from a focus on the surface features and on the perceived meaning of the text to one of examining the reader's own thinking process before, during, and after reading. In other words, it is like taking a bird's eye view of the reading process. Readers do this by (a) setting goals for the reading, (b) monitoring their reading, and (c) reflecting on their reading performance by comparing their performance with their reading goals. This stepping back process also affects the readers' ideas, opinions, and responses to their reading and thinking activity. It may also affect the readers' motivation, self-efficacy, and self-perceptions as a competent reader. Motivated students usually want to understand text content fully and, therefore, process information more deeply. The more they practice using this interactive processes the more gains they make in reading comprehension proficiency (Ehren, 2009; Guthrie et al., 2004).

Text Structure: Local and Global Coherence

In general, the ability to integrate contextual information into a situation model during reading enables readers to build a coherent representation of a text's theme and meanings (Kintsch, 1998; Van der Schoot, Vasbinder, Horsley, Reijntjes, & Van Lieshout, 2009). However, not all readers utilise the existing text structure, such as grammatical and contextual meaning cues, but need to be encouraged to actively use their inferential skills when reading (Bishop, 1997; Bowyer-Crane & Snowling, 2005; Catts, Hogan, & Fey, 2003). Poor readers, in particular, have difficulty visualising story content at the local level of understanding and also have difficulty

retelling the gist of stories at a more global level (Diehl, Bennetto, & Young, 2006; Pressley, 2002; Woolley & Hay, 2004).

The ability to integrate visual and verbal contextual information within a text (print or screen) is also important for comprehension because it helps the reader to build a coherent mental situation model of a text's meaning (Kintsch, 1998; Van der Schoot et al., 2009). Thus, to support the reader's construction of a situation model a text must have a logical structure and contain a number of cohesive devices at the local (sentence and paragraph) level and also at the global (theme or discourse) level. For example, at the local level, a preposition such as 'he' or 'she' will give coherence by linking ideas across sentences. At the global level a story must have a logical time-ordered sequence (Morrow, 1985; Trabasso & Sperry, 1985) and the sequencing of the events in a story should also have good causal connections (Renz et al., 2003). Understanding the causal connections, as they relate to an event, or sequence of events is important for the establishment of a coherent representation of a story's content (Renz et al.). Linguistic structures, such as these, are important cohesive devices that facilitate the global organisation and comprehension of text information because they will incorporate the overall story theme or ghist (Kintsch, 1982). The story theme also has a strategic role to play in building an appropriate situation modeling (Harris & Pressley, 1991; Zhang & Hoosain, 2001).

At the local level of understanding visual imagery can be used to facilitate the inferential linking of new information with existing prior knowledge (Woolley, 2006a, 2006b). However, many less skilled readers will have more difficulty utilising overall text structure, such as grammatical and contextual meaning cues, and need to be encouraged to use their inferential skills when reading (Bishop, 1997; Bowyer-Crane & Snowling, 2005; Catts et al., 2003). In particular, such readers appear to have difficulty visualising story content at the local level of understanding and also have difficulty re-telling the gist of stories at the more global level (Diehl et al., 2006; Pressley, 2002; Woolley & Hay, 2004).

In developing coherence at the global level in a narrative, for example, the reader needs to determine the relative importance of the narrated events. The relative importance will increase with the number of causal connections that link the events to the main ideas (Diehl et al., 2006). This linking process makes it easier for the reader to connect with existing ideas about the story and facilitates the incorporation of prior knowledge. In contrast, when elements within the text are not cohesive, it can make comprehension more difficult for the reader. For example, information that is situated further away from the main theme will be more likely to be forgotten than information with more direct connections to the overall content structure (Meyer, 1975). Coherence at the global level can be augmented when teachers explicitly draw the student's attention to the structural elements of the text. As a result, a number of researchers have found that graphic organisers can link global conceptualisations, particularly when this process is used as a cooperative group activity where discussion of related ideas can take place (Nesbit & Adesope, 2006; Van Boxtel, Van der Linden, Roelofs, & Erkens, 2002).

Knowledge of how texts are structured is one of the most important elements that will lead to efficient reading comprehension (Marr & Gormley, 1982; Pearson, Roehler, Dole, & Duffy, 1992; Whaley, 1981). Normally, skilled readers use some structure or schema to construct their mental models by organising their stories with settings, plots, and episodes (Diehl et al., 2006). A graphic pre-organiser can strategically be used before the reading of a text to support the reader by providing a suitable schema or framework for them to organise and link text ideas.

Instruction and Pedagogical Frameworks

Traditionally reading comprehension has been taught in discrete lessons that introduce individual strategies such as finding the main idea, summarising, and using higher-order questions one at a time. However, it has been suggested that many children are unsure of when, where, and how to apply these strategies to new reading tasks (Afflerbach, Pearson, & Paris, 2008; Pressley, 2002). Consequently, reading comprehension strategies should be developed routinely and practised over a long period of time on a variety of reading topics and genres (Block, Paris, Reed, Whiteley, & Cleveland, 2009). Several researchers have also posited that the simultaneous teaching of a combination of strategies will need to be routinely applied (National Reading Panel [NRP], 2000; Pressley, 2002). This is necessary because skilled readers seldom use only one strategy at a time. Reading comprehension is complex and operates on a number of levels concurrently, and students need to apply these strategies over a lengthy period of time to develop the right balance.

There have been a number of instructional approaches that have attempted to provide a framework in order to routinely practice comprehension skills using a limited number of comprehension enhancing strategies. For example, reciprocal teaching (Palincsar & Brown, 1984) is possibly one of the most well-known frameworks consisting of four strategies: predicting, questioning, clarifying, and summarising. This framework was originally designed as a group intervention for students with reading comprehension difficulties but has been applied to reading groups in a variety of situations and age groups with consistently improved outcomes (Klinger & Vaughn, 1996; Le Fevre, Moore, & Wilkinson, 2003; Pilonieta & Medina, 2009). A central element of this framework is the requirement that students generate their own questions in order to become 'the teacher'. This reversal of the questioning role enables the empowering of students by forcing them to take responsibility for their own learning.

It has be observed that students who have been taught to compose their own questions were perceived as taking a strategic and self-regulatory role in the learning process (Palincsar & Brown, 1984). This activity enables them to step into a deeper thinking process as they ponder relationships among the various aspects of the text. However, students who tend to ask lower-order questions are more likely to focus more on the local level information and may have difficulty identifying the overall global text structure (Taboada & Guthrie, 2006). In contrast, students who

are encouraged to formulate higher-order or open-ended questions are able to connect with their prior knowledge more easily. Higher-order questions are most useful because they tend to anticipate the macrostructure of the text and main interrelationships among the ideas within the story. Moreover, readers who ask high-order questions are more likely to construct mental situation models into which the text details will more easily be assimilated. Such readers anticipate and apply a more global structure. Thus, higher-order questions tend to enable hierarchical cognitive structures that are characterised by a larger number of connections and relationships among the major concepts in the text (Kintsch, 1998).

KWL (Ogle, 1986) is another example of a reading comprehension framework that orchestrates the three components of: 'What do I know?' 'What do I want to Know?' And 'What have I learned?' Once again this framework has been used in classrooms extensively since it was first designed. Like the reciprocal teaching framework, it has self-regulation processes embedded in the structure with self-questioning as a central element.

The NRP (2000) identified, from the available body of reading research, a number of strategies that were found to be most effective for developing reading comprehension. Pressley (2002) also indicated that there was a great deal that we already know about reading comprehension and what strategies work. He also suggested that there was a pressing need to know what strategies work together more efficiently. When considering what comprehension strategies should be included, the NRP, and a number of other researchers, suggested that both visual mental imagery techniques should also be incorporated in the mix because they foster inferential linking, deeper engagement, and interest while reading (Long, Winograd, & Bridge, 1989; Romeo, 2002; Sadoski & Quast, 1990; Tobias, 1994). However, despite the evidence, visualisation strategies have yet to be fully utilized and included in class-room reading comprehension practice (Pressley, 2002).

COR Framework

The 'Comprehension of the Narrative' (Woolley, 2006a, 2006b) intervention is a reading comprehension framework that used a nine-step process that routinely introduced individual students with reading difficulties to imaginative strategies to develop reading comprehension that focused on the narrative genre. The COR literacy framework (Woolley, 2006b: also see Troegger, 2011) was an extension of the nine-step procedure to be applied to information texts with small groups of students. It draws its name from the three phases of reading: before (Conceptualise), during (Organise), and after (Reflect) reading. It was intended as a flexible framework to incorporate the three levels of text processing (stepping forward, stepping into, and stepping back). It should accommodate a range of visual and verbal strategies in the regular classroom to investigate thematic content (see Table 13.1 for an adaptation of the framework). The framework described in Table 13.1 has been included to

Table 13.1 COR literacy framework (incorporating some visualisation strategies)

Levels of processing	Phases		
	Before reading (conceptualise)	During reading (organise)	After reading (reflect)
Stepping forward	Scanning the text and illustrations. Searching for unfamiliar words and phrases	Decoding, developing propositions, monitoring for meaning and using fix-up strategies for when the reading does not make sense	Recalling factual content, summarising, reconceptualising
Stepping in-to	Local: Visualising similar scenes from similar background experiences to draw the opening scene of the story	Local: Stopping at an appropriate place in the narrative and drawing a picture related to story events as the plot unfolds	Local: Recalling mental imagery by creating a drawing related to story events, characters, and places
	Global: Using a graphic organiser to understand the structure of the text to be read. Asking questions to help elaborate drawn pictures	Global: Asking and answering questions related to character actions and scenes as it relates to the drawings	Global: Using the graphic organiser as a way to organise a summary by placing each of the three drawings in the appropriate space on the organiser and making an oral summary
Stepping back	Goal setting; predicting - What do I think will happen in this story? Visualise likely scenarios	Monitoring meaning/self-questioning. Is the story similar to what I imagined at the beginning? How is it the same/different? What do I think will happen now? Visualise a revised scenario	Reflection on strategies used. What can I imagine now that I have come to the end? Were my predictions accurate? What was expected/unexpected? What else could I have considered?

provide an example of a flexible multiple-strategy framework to show how and when visual and verbal strategies can be orchestrated within a lesson.

The framework should not be restricted to visualisation strategies but can incorporate any pedagogical techniques that are consistent with the processing level and that will match the before, during or after phase of the lesson. For example, it could accommodate other procedures, such as the pause, prompt, praise (Houghton & Glynn, 1993) method of guided reading, which could be inserted in the appropriate cells at the stepping forward level, while the four reciprocal reading strategies could be inserted into the stepping into and stepping back levels. However, the stepping back level should conform to a goal-setting, monitoring, and reflection process to enable a self-regulation orientation. It is asserted that the framework is meant to structure the pedagogical practices and provide a coordinated approach to using multiple comprehension strategies.

Illustrations

Illustrations can help to develop visual representations of main ideas and may also provide a visual summary, particularly for younger readers (Kendeou, Savage, & Van den Broek, 2009). Readers can also derive character depth and meaning from illustrations in picture books and comics (Duke & Pearson, 2002; Roser, Martinez, Fuhrken, & McDonnold, 2007; Van Meter, Aleksic, Schwartz, & Garner, 2006). While looking at illustrations during the reading episodes it is presumed that readers construct and incorporate the visual material into their mental modeling process (Glenberg & Langston, 1992). Good illustrations, in particular, will assist younger or less experienced readers with their comprehension by linking their background knowledge with the unfolding illustrations and filling in missing information that is not normally provided in the text. When the illustrations are discussed and elaborated the verbal and nonverbal memory representations are better organised and can be linked in working memory (Van Meter et al., 2006). It is assumed that older and more able readers tend to naturally visualise story content and rely less on illustrations than younger or less skilled readers (Hibbing & Rankin-Erickson, 2003).

The integration of knowledge is different when learners read and draw as opposed to when readers merely examine illustrations (Van Meter et al., 2006). A number of researchers have posited that students' drawing of text content and story events is an effective visualisation strategy that enhances students' mental situation models (Kintsch, 1994). Drawing is particularly beneficial because it is usually a goal-directed activity that enables improved reading comprehension because it creates a concrete organisation of text information (Van Meter et al., 2006). Furthermore, when students draw they typically use self-monitoring processes to compare their attempts with what they consider to be important. The act of drawing taps directly into the students' store of life experiences and background knowledge because it is not possible to draw what they have not previously encountered or understood. Ordinarily, there will be a difference in the quality of the drawing according to

students' age and fine motor skills, and the quantity and quality of students' background experiences, and this is what contributes to a more efficient integration of information in working memory. The quality of the vocabulary and the text-based language structures will also affect the students' ability to include elaborated detail into their drawings and develop deeper comprehension (Perfetti, 2007).

Manipulating

Roser et al. (2007) maintained that a story character's situation could become more concrete, more comprehensible, and more able to be discussed when actual objects, items, pictures, and maps are used to rehearse story content or events. For example, Glenberg, Brown, and Levin (2007) found that when readers were required to manoeuvre objects to recreate the characters and their actions their story recall and inferencing ability was enhanced. The researchers maintained that manipulations of story-related objects enabled the readers to link words to the mental representation of the objects as well as requiring the reader to mentally visualise story elements and important relationships. They observed that the readers tended to retain their imagined scenarios several days later as a direct result of the manipulation strategy.

Acting, Role-Playing and Characterisation

Kelin (2007) used drama as a visualisation activity to help young students enhance their ability to translate the experiences of a story into the context of their own lives. It provided the readers with a vehicle to empathise with the protagonist's perspective through the simulation of events within a story. The interaction of the protagonist with other story characters may be important to tie together ideas within a narrative (Harvey & Goudvis, 2000; Roser et al., 2007; Wade, Buxton, & Kelly, 1999). For example, characters within stories are usually shaped by their situations and interaction with other characters, settings and plots. Emery (1996) found that when students also discussed the story from a character's perspective they were better able to identify the story's central plot and were more able to develop appropriate retellings.

It should be noted that younger children tend to place more importance on the actions of characters in their causal models of stories. In contrast, older readers are more able to focus on the mental states of characters and on the more abstract story ideas. Older children also seem to show a stronger tendency in establishing causal connections across story episodes and with longer text discourse than younger children (Rapp, Van den Broek, McMaster, Kendeou, & Espin, 2007). Thus, skilled or older readers are enabled to progress to lengthier, complex books by encountering increasingly well-developed characters that react to circumstances in meaningful and predictable ways throughout the course of the narrative (Roser et al., 2007).

Mental Imagery

Mental imagery is the process of creating an image in the mind. Researchers have found that the use of mental imagery as a mental strategy results in greatly improved reading comprehension outcomes (NRP, 2000; Pressley, 2002; Sadoski & Quast, 1990). It effectively links read text information to the reader's own background experiences and provides a memory strategy that helps with recall and comprehension (Joffe et al., 2007; Kosslyn, 1976). Furthermore, when rich descriptive texts are read, the rich language enables readers to visualise with a higher level of intensity that leads to improved comprehension outcomes (Romeo, 2002). Moreover, the vividness of mental imagery activated during reading will increase reading engagement because imagery relies on the activation of personal prior experiences (Farah, 1995). Focused discussion at strategic points during the reading can help to develop the vividness or intensity of the mental imagery (Bell, 1986; Woolley & Hay, 2004). For example, focusing on character perspectives (or mentally placing students in the shoes of the story characters) will guide learners' attention to features that are often less explicit within the text (Rapp et al., 2007; Van Meter et al., 2006). Moreover, by developing a routine of stopping and discussing their character-based visualisations children will be more able to independently practise the strategy until it becomes an automatic mental process during reading. The expectation is that when readers read independently they should focus on meaning (McKeon, Beck, & Blake, 2009) and visualise story content continuously throughout the reading activity (Woolley & Hay, 2004).

Linking Visual and Verbal Strategies

Van Meter et al. (2006) found that upper primary school participants learned more when the drawing strategy, for example, was used with supported dialogue. Thus, the nonverbal or visual representations may be complemented by the incorporation of verbal descriptions and directions. For example, when drawing, a learner may see the need to determine the specific location of an item and seek verbal input from others to build a more appropriate visual representation.

Many reading comprehension problems can be attributed to the inability to use language appropriately to organise students' thinking and reading performances (Leekam, 2007). For example, vocabulary knowledge underlies all learning and is one of the most significant predictors of reading comprehension, however, the acquisition of vocabulary and its usefulness depends on the quality of word representations and the way in which they are encoded and linked in working memory (Perfetti, 2007; Van der Schoot et al., 2009). Blachowicz, Fisher, and Ogle (2006) maintained that the ability to make suitable inferences is a crucial component in learning the meaning of new words. The construction of a concept map during a reading lesson helps learners develop this depth of word meanings and contributes

to the development of an integrated mental model of the text being read (Van Boxtel et al., 2002). This technique is further improved when applied in a collaborative setting with engaging discussion (also see Perfetti, 2007).

Self-Regulation and Engagement

Effective comprehension requires readers to be metacognitively aware by thinking about their own learning processes and take control of the reading so that they can make the necessary adjustments as they read. Thus, a metacognitive teaching focus should involve setting reading goals, monitoring and reflecting in order to develop self-regulation (Afflerbach et al., 2008; Zimmerman, 2002). As a result, readers will be more able to selectively use attention to focus on the important aspects of the text, develop main ideas, hypothesise about content, make predictions about upcoming information, and monitor their own comprehension. For example, during the reading readers may ask themselves questions such as "Does this make sense?" If it does not make sense, they apply suitable repair strategies to restore comprehension (Van der Schoot et al., 2009).

A collaborative approach incorporating techniques, such as questioning and peer prompting in which children adopt cooperative roles in analysing texts has been shown to greatly assist metacognitive processes (McKeon et al., 2009; Pressley, 2006).

It has been demonstrated that teaching reading and thinking processes to students through dialogic interactions can increase student's engagement and control of the reading comprehension process (Cole, 2002; Guthrie & Davis, 2003; Hareli & Weiner, 2002; Whitehurst & Lonigan, 1988). Collaborative groupings that incorporate interactive dialogue have been shown to develop higher student achievement and more positive social, motivational, and attitudinal outcomes (Gambrell, Malloy, & Mazzoni, 2007; Overett & Donald, 1998; Woolley, 2007).

The involvement of students in group discussions before, during, and after reading or listening to a story has been shown to lead to improved comprehension, particularly when the teacher models questions or prompts students to describe what they have read (Gambrell, Mazzoni, & Almasi, 2000). Teacher-directed questions can be effective by focusing students' attention on text segments containing information being sought (Taboada & Guthrie, 2006). Moreover, encouraging children to give explanatory answers to those questions leads to better comprehension of text and enables a more strategic use of language (Snow, 2002). Requiring students to explain should promote active learning and lead to a significant improvement of their metacognitive strategies (Griffin, Wiley, & Thiede, 2008).

Such techniques can be used in association with visualisation strategies and augmented by other strategies such as comprehension monitoring, self-explanations, identification of the main idea, previewing, predicting, and summarising text etcetera (Kirby & Savage, 2008). Metacognitive strategies such as these should

be included in all instructional frameworks to support the integration of new and existing strategies. A metacognitive focus, such as this, should lead to student self-regulation and self-determination (Zimmerman, 2002).

Conclusion

Despite the efficacy of visual and verbal comprehension strategies they have not, as yet, been used extensively in multiple-strategy intervention programs. However, there are a number of evidence-based visualising strategies that can be employed in intervention programs to enhance the local and global levels of understanding. Readers construct mental models that incorporate text-based information with their available prior knowledge. The ability to form a suitable mental model may be enhanced by the ability to form mental imagery before, during, and after reading. The incorporation of mental imagery will enhance the efficiency of students' working memories by linking their available resources. Thus, visual and verbal instructional techniques can alleviate cognitive capacity limitations by more efficiently linking information placed within the subsystems of working memory. Visualisation of story content and entering into engaging dialogue with others elaborates new information and deepens the quality of their mental representations. It also enables the reader to make connections between verbal and visual content in a much more integrated way. Thus, the quality of a reader's mental model will be enhanced by the quality of the linking of information within working memory.

It is important to use a number of strategies in a literacy framework and to apply these strategies routinely over several reading episodes to consolidate those strategies and to develop automaticity. Comprehension strategy use will be enhanced when readers are encouraged to link visual and verbal content and actively monitor and reflect on the comprehension process by using self-questioning and self-explanations. Moreover, when applied in an interactive collaborative context, self-regulation and reading engagement is more likely to be promoted.

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