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ABSTRACT

The goal in Reading Recovery is to support children to develop "in the head" operations or strategies that aid them to solve problems as they read and write continuous text. To help children in organizing experience and correct any idiosyncratic or unreliable relationships, teachers must understand how children develop their internal processing system, how they construct inner control, and how to best support their efforts. The means by which a system of language use is developed in the young literacy learner depends on refinement of both the cognitive and visual processing systems. As this internal processing system matures, the role of attention shifts and fluency is more constant. Reading Recovery teachers need to have a fairly accurate model of how each child normally solves his or her problems. The tasks of book introduction and first reading are important: by selecting a book carefully with an expectation of how this text will influence the child's internal processing system, the teacher takes into account how the child is currently able to solve problems. Within the first reading, teachers are observing and responding to the overall processing system, the partially correct responding, correct responding, and prompted responding. The goal is to facilitate the child's developing a self-extending system of literacy expertise. Contains 9 references. (RS)

Developing an Internal Processing System.

by Diane DeFord

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In This Issue...

Network News

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Developing an Internal Processing System

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Over the past year, at institutes and in professional development, we have emphasized the importance of thinking about how children process information in both reading and writing as we teach every day. The result of this attention has been an increase in strategic processing in our children as evidenced, in part, by increased fluency in many of the lessons I have observed. If we can keep processing at the center of our work with children, I believe we will improve our overall program results.

Our goal in Reading Recovery is to support children to develop "in the head" operations, or strategies that aid them to solve problems as they read and write continuous text. It sounds simple, but as each one of us knows, it is a highly complex process. The complexity arises for teachers and learners because it is important for the processes of reading and writing to remain intact simultaneously as children learn. Teaching, then, must support the integrity of the child's processing while it matures, and provide sufficient lift as a child learns to attend to new aspects of print, messages, and language while reading and writing continuous text. The complexity of reading and writing as processes must operate as children search for links between what they are learning and what they know, "searching for relationships which order the complexity of print and therefore simplify it" (Clay, 1993, p. 39). By focusing on how children are processing and what they are attending to, the teacher can assist the learner in organizing experience and help correct any idiosyncratic or unreliable relationships. To do this effectively, we must understand how children develop this internal processing system, how they construct inner control, and how to best support their efforts.

The Centrality of Language

Translations of the writing of Vygotsky (1978) and Luria (1961, 1973) have provided us with a great deal of insight into the power of language as a tool for learning. They discuss language as a tool for intellectual activity, a means of communication in the use of and transmission of information. Language provides a multidimensional tool within intellectual activity. As Luria (1973, p. 306-309) indicates, it is through language that we have a method:

- of regulating or organizing mental processes
- of analysis and generalization of incoming information
- of formulating decisions and drawing conclusions
- for use in operations of abstraction and generalization and as a basis of categorical thinking
- of providing a structure for the analysis of language itself, or an executive operation:

1. conducting acoustic or phonemic analysis for the discrimination of language and production of articulatory cues
2. organizing networks of morphological groups (constancy, privacy) and

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semantic groups (hospitals, schools, and police stations as public institutions)

3. transforming thought into speech (and vice versa) using sentences and narrative structures

We can see the power of this tool throughout a child's program in Reading Recovery. As Clay (1991) describes shifts in monitoring, for example, we can see how dominantly children use their knowledge of oral language to help regulate the activity of reading:

> At first he detects errors of meaning or sentence structure by reference to his oral language system and when they occur he is expected to try to solve the problem by reading work. He may have to seek more information or help. Gradually the child begins to detect errors because of what he is learning about the visual forms of print, and their relationship to the sounds of his spoken language. In this way his monitoring behaviour is enriched by new strategies for working on the information in print which go beyond his oral language control. (p. 197)

As a reader engages with a book or in writing text, language provides the means by which regulation, analysis, generalizations, decisions, categories and networks of understanding are constructed. Language itself is structured. Rules of order, sequence, syntax, and semantic relations govern how it works. Consequently, when engaging in a language process such as in reading or writing, those activities engage the learner in using language as a tool. The means by which this system of language use is developed in the young literacy learner depends on refinement of both the cognitive and visual processing systems.

Cognitive and Visual Processing

The brain is a complex information processing system. Within humans it has been raised to its highest level of performance through the development of language. By considering the interconnectiveness of how cognition and perception function within the working brain, we can begin to understand the internal structure of mental activity used in reading and writing that I am referring to as an internal processing system.

Perception is the process or act of perceiving, recognizing and interpreting sensory stimuli. Cognition is the mental process of coming to know through the use of awareness, perception, reasoning, intuition, and judgment. Cognition, then, is the larger umbrella of mental activity that utilizes sensory information (e.g. visual, auditory, smell, taste, touch) as input. Visual perception is part of the inner processing system that readers develop, the understanding of how letters and words work as the building blocks of language. As Clay (1991) states:

> The beginning reader has to give attention to visual information as well as the language and messages but gradually becomes able to use visual information without much conscious attention, freeing more attention for the messages and language of the text and for novel information which expands the system. (p. 287)

This suggests that language is the tool the reader or writer uses to construct a system for regulating, analyzing, generalizing, decision making, and producing categorical sets and networks of understanding about written language. What the learner perceives, the mind uses to form hypotheses and make judgments about. What the learner attends to as visual perception and mental operations come together will change as this internal processing system matures. Many of the procedures that are described in *Reading Recovery: A Guidebook for Teachers in Training* (Clay, 1993) grew out of decisions about how to help the child attend to different sources of information using strategic problem solving.

The relationship between cognitive and perceptual processing is dynamic. Cognitive processing is generally conscious and apparent to the reader, while perceptual processing is rarely so (Clay, 1991). We only focus on aspects of perception when there is an immediate problem at hand (an unusual picture, tasting a new recipe, hearing a sudden or different noise, etc.) But the process of making a decision about what has been perceived requires thought, weighing of evidence, and the formation of hypotheses to guide our actions. As Clay further suggests, a theory of how these aspects of the working brain must encompass: "...the reader's conscious message-getting activities, the conscious search for and analysis of other types of information, the necessary vigilance, and error detection processes, together with the highly practiced perceptual responding which requires so little attention" (p. 287).

The skillful Reading Recovery teacher weighs the child's attention to differing perceptual aspects and how the child processes this information to make instructional decisions. For example, we know that "children solve practical tasks with the help of their speech, as well as their eyes and hands" (Vygotsky, 1978, p. 26). Consequently, early in the child's program, the teacher observes carefully as a child uses the hand (manual activity) to support the eye in order to make the voice match with the written message. As the child gains control of this early one-to-one matching behavior, the teacher looks for opportunities to guide the child away from use of the finger so that the eye can become more skilled at following the message while monitoring if the voice/print match is maintained. As this highly practiced visual responding for eye/voice matching is under control, the teacher calls for greater flexibility. The principle in operation here is that "as soon as control is firmly established the teacher should begin to call for flexible use of that control" (Clay, 1993, p. 52).

Later in the child's program, the type of visual responding that has to be incorporated into this internal processing system requires further refinement. As texts become more complex, the demands placed on the reader require finer discriminations in both hierarchical and serial order operations. New and unusual words, embedded story structures, complex figurative and descriptive language create new levels of probability for the read-

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er, taking them beyond the language of home into the compact language of literature. The internal processing system must become fast and selective, and the reader's visual responding must operate more on the anticipation of possible structures than consistent attention to the details of print.

Fluency in reading, and fluent action in writing, indicates that the child is orchestrating the many aspects of the reading or writing process in a balanced way. For the moment, I want to focus on reading. Fluency in reading involves the orchestrated use of linguistic information so that the reader's pitch, stress, and juncture sound like phrased reading. While a certain degree of accuracy is associated with fluent reading, the more critical aspects relate to juncture (pauses in voicing), pitch (the rise and fall of the voice), stress (voice emphasis), and the orchestration of meaning, syntax, and visual and non-visual information systems within the flow of reading (DeFord, 1991). High progress readers provide a good model for how these variables operate. Clay and Imlach (1971) found that high progress readers used short pauses at punctuation marks, with a mean of 7.4 words read between pauses. They displayed great pitch variation at appropriate junctures, and stressed one word out of 4.7 words. In reading "Once upon a time/ THERE were three little pigs/" we would all agree that the reader exhibited phrased, fluent reading. On the other hand, we might hear a different rendition: "Once/upon/a time/there/were/three/little pigs." If this reading was characterized by rising or sustained pitch and long pauses in between most words, we would have to agree there was a lack of fluency. In this latter instance, the eye and the voice are moving slowly so as to examine each word. The reader cannot "anticipate" what is most likely to occur, rather he is attending to more of the details of print.

Smith (1988) argues that for comprehension to occur, reading must be fast and selective, and must depend upon the use of nonvisual information. The brain must process quickly to avoid becoming bogged down in the visual detail of the text. In order for the reader's internal processing system to move forward with momentum, meaning and language must propel the process. The reader will then pay less attention to visual information, or it becomes more automatic. Wood (1988) describes this capacity to *perceive* as well as to *perform* (as in the case of reading or writing), two aspects of a single process, as following a spiral path in development.

> As the child becomes practiced in acting upon some component or components of the task, her actions become increasingly automatic... However, developing 'automaticity' means that the child no longer has to consciously attend to the practiced elements of her task activity. 'Automated' actions may be performed without the need for constant monitoring or awareness. As some aspect of the developing skill is automated, the learner is left free to pay attention to some other aspect of the task at hand. She 'perceives' more and can concentrate on perfecting some other feature of her performance. So the metaphorical spiral grows in diameter as expertise develops. (In Clay, 1991, p. 322)

As this internal processing system matures, the role of attention shifts and fluency, or fluent action in writing, is more constant as the reader and writer becomes more flexible with the variety of routines and subroutines that are required. In this way, the reader and writer utilizes monitoring, searching, and solving in an ongoing way on more complex text, on less familiar language, and within a variety of text genre.

The Construction of Inner Control and Teacher Assistance

As we observe the differing paths children take in the process of becoming literate, we are often humbled by the enormity of the task of learning to read and write. For it is the child who must construct the inner control referred to by Clay (1991), the systems that allow each child to learn through reading and writing. As Clay points out, much of what the child is actually learning is hidden from our view, and in order to make responses that are of value, we have to have a fairly accurate model of how each child normally solves his problems (p.196). One very important task that we must take very seriously, then, is the book introduction and first reading.

By selecting books carefully with an expectation of how this text will influence the child's internal processing system, the teacher takes into account how the child is currently able to solve problems, what strategies he or she has available, what information is potentially new, what will be easy, and what should be emphasized to aid the child's attention. Clay (1993) indicates we must facilitate the child's reading as well as help the child orient to the book itself (p. 37). The child must adjust or align himself to the book, beginning to anticipate what the book holds in store, so that he "has in his head the ideas and the language he needs to produce when prompted in sequence by print cues... He should know what the story is about before he reads it." In essence, this orientation provides the familiarity that is lacking whenever a new text is taken up for reading. The goal across the program, however, is to bring the child to be able to orient himself to new books so that he can read those independently selected books through his own efforts.

Within the first reading, we are observing and responding to the overall processing system, the partially correct responding, correct responding, and prompted responding. Whatever the intervention, our focus must be on what action (or nonaction) will bring about the necessary lift within the internal processing system the child has in operation at that point in time. Prompting at too low or too high a level will draw the child's attention away from the problem to be solved.

Our goal is to facilitate the child's developing "a self-extending system of literacy expertise" (Clay, 1991, p. 317), such that every act of reading and writing expands the range and effectiveness of strategies the learner brings to the task, and the size of

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the practiced response repertoire upon which he can draw.

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