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THE DEVELOPMENT OF CHILDREN'S STRATEGIC PROCESSING IN READING RECOVERY

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It was the purpose of this study to examine and describe first-grade children's development of strategic processes for detecting and correcting errors, problem solving difficult or novel words, and confirming responses in order to be successful as they participated in Reading Recovery instruction, as opposed to simply increasing "item" knowledge (i.e., identifying more letters, recognizing more words, etc.) as is true so often in special assistance tutoring (Allington & Walmsley, 1995). Further, the intent was to investigate qualitative differences in children's strategic processing and to determine if growth in strategic processing is related to differences in entry-level skills. And finally, this study investigated whether an extended evaluation format for running record analysis developed by the author could provide useful information about children's progress toward independent, strategic reading.

Participants in the study included 27 children who were receiving Reading Recovery instruction in four schools in a large Midwestern city. Running records of text reading (Clay, 1993a) were collected at three points in their programs and analyzed for strategic processing. A repeated measures ANOVA was conducted to explore children's development of the use of problem-solving strategies as well as the outcome of their attempts. This analysis revealed that as a group these children significantly increased their use of all strategies as suggested by behavioral indicators (e.g., substitution attempts, rereading, etc.) and decreased the number of unproductive attempts. Qualitative differences in strategic processing are discussed and implications for instruction are provided.

The Development of Strategic Processing in Reading Recovery

Paris, Wasik, and Turner, in *The Handbook of Reading Research, Volume II* (1991), discuss the complicated concept of "strategic reading." It is clear from their discussion that there are differing explanations of what it means to be strategic, who can achieve this state, and whether or not it takes conscious awareness and deliberate action. They call strategic reading:

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> . . . a prime characteristic of expert readers because it is woven into the fabric of children's cognitive development and is necessary for success in school. There are six crucial reasons why strategic reading is fundamental to the development and education of children. First, strategies allow readers to elaborate, organize, and evaluate information derived from text. Second, the acquisition of reading strategies coincides and overlaps with the development during childhood of multiple cognitive strategies to enhance attentions, memory, communication and learning. Third, strategies are controllable by readers; they are personal cognitive tools that can be used selectively and flexibly. Fourth, strategic reading reflects metacognition and motivation because readers need to have both the knowledge and disposition to use strategies. Fifth, strategies that foster reading and thinking can be taught directly by teachers. And sixth, strategic reading can enhance learning throughout the curriculum. (p. 609)

Although Paris and his colleagues discuss strategic reading in relation to older, more proficient readers, rather than novices, as first graders would certainly be, there is increasingly more discussion about and evidence that young children develop cognitive strategies in preschool years and can learn to apply these strategies to literacy learning if they are in supportive contexts that foster such development (e.g., Clay, 1991; Clay & Cazden, 1990; Cox, 1994; Rowe, 1989; Schmitt, 1988; Schmitt, Younts, & Hopkins, 1994).

This paper explores young children's development as "strategic readers" as they participate in the Reading Recovery Program. In this early literacy intervention program, founded by New Zealand educator Marie Clay, the primary goal is that children become self-regulated, strategic learners who see, search, monitor, generate, evaluate, select, predict, check, validate, confirm, attempt and reject solutions, revise, etc. As constructive learners the children must develop "an interlocking network of appropriate strategies which include monitoring and evaluation of consonance or dissonance among messages that ought to agree . . . " (Clay, 1991, p. 329). Consider the strategic processing involved in trying to construct a plausible interpretation of a text as described by Clay (1991):

> At the moment of making an error a child reading for meaning will notice it. To continue, the reader has to take some action. At this moment he is observing his own behavior very closely because he will have to decide which response he should retain and which he should discard. As the

> beginning reader searches and selects in rough and ready ways he must carry out two further types of self-regulatory action. He observes his own behavior and he assesses his own behavior. Has he solved it? Has he got it right? Do all the angles of this piece of the jigsaw fit in that particular slot? His search ends when it makes sense within his knowledge of the world.
>
> . . . The competent children resourcefully cast around all their experience to find cues, strategies, and solutions. The appropriate questions are: What do I know that might help? How do I know this? What can link up with this? Is the message still clear? (p. 341).

Indeed Clay is talking about *all* children becoming literate, but she acknowledges that *some* children will need extra help toward this end. Reading Recovery was designed to meet the needs of children who require special attention and individual instruction, but the goal is still the same, that is, strategic processing. Is that possible for the lowest achievers in a first-grade class?

It was the purpose of this study to examine and describe first-grade children's development of strategic processes for detecting and correcting error, problem solving difficult or novel words, and confirming responses in order to be successful as they participated in Reading Recovery instruction, as opposed to simply increasing "item" knowledge (i.e., identifying more letters, recognizing more words, etc.) as is true so often in special assistance tutoring (Allington & Walmsley, 1995). Further, the intent was to investigate qualitative differences in children's strategic processing and to determine if growth in strategic processing is related to differences in entry-level skills. And finally, this study investigated whether an extended evaluation format for running record analysis developed by the author could provide useful information about children's progress toward independent, strategic reading. The strategies measured in the analysis format are consistent with the strategies that are the focus of the Reading Recovery teaching procedures.

Brief Description of the Reading Recovery Program

Reading Recovery is an early intervention literacy program for first graders that involves individual daily tutoring by specially trained teachers (Clay, 1979, 1993b). The goal of this intervention that represents the school's efforts to provide a safety net for struggling learners is for children to reach the average level of their

peers on measures of text reading, word identification, writing vocabulary knowledge, and phonemic awareness. It is designed to be a short-term intervention that affords children the opportunity to achieve accelerated progress and begin to benefit from classroom instruction. The intervention serves to close the gap between average and low-progress learners and reduces the numbers of struggling readers in first-grade classrooms and beyond. The instructional goal is that children develop a "self-extending system of strategies" that allows them to become better readers each time they have the opportunity to read and problem solve on more challenging text (Clay, 1991).

There are two positive outcomes of Reading Recovery instruction: (a) children reach the average level of their peers and their service is "discontinued;" or (b) after at least twenty weeks of intensive instruction, a group of educators reviews the information gained relative to the child's strengths and weaknesses and makes a decision regarding a longer-term intervention. In the latter case, the child's program is considered "not-discontinued" (Askew, Fountas, Lyons, Pinnell, & Schmitt, 1998).

Method

Participants

Children participating in Reading Recovery instruction in one of four suburban school sites in a large Midwestern city were selected for analysis in this investigation. The 27 first-grade children were being taught by six experienced Reading Recovery teachers who were being supported by the district's teacher leader. These children were selected for Reading Recovery instruction through a collaborative process involving the classroom teachers' ranking of the children according to kindergarten and early first grade achievement and the results of *An Observation Survey of Early Literacy Achievement* (Clay, 1993a). The observational tasks in the survey provide information about letter knowledge, word recognition, writing vocabulary, sound to letter analysis in writing a dictated story, knowledge of concepts about print, and skill in reading continuous text.

The lowest-achieving children in the schools were chosen to

participate in the program, excluding no child for any reason. These 27 children received parental consent to participate in the study. Ten children were eventually released from the study because they moved from the district or were being referred for psychological testing. The remaining 17 children included: 6 females and 11 males, 7 African Americans and 10 European Americans, 5 children from low-income and 12 children from middle-income households (as measured by participation in free or reduced-price lunch program).

Procedures

Using Sulzby's (1985) *Categories of Storybook Reading*, emergent reading levels were obtained for the children. To determine these levels, a familiar adult researcher asked the children to "pretend read" a storybook. The children's oral renditions of the storybooks were classified into three broad categories relating to the progression from a "picture-governed, no story" category (8 children) to "oral-like story" (7 children), to the more advanced "written-like story" (3 children). These emergent reading levels were used to explore a relationship with successful strategy use as children progressed through the program.

Oral reading of continuous text was measured, by means of running records (Clay, 1993a), at three points during the study: (a) during initial testing, (b) when the children had reached text level 5, and (c) when they had reached text level 10. It was felt that these levels represented requisite shifts in children's strategy use in order to be successful, based on the author's experience as a Reading Recovery Trainer of Teacher Leaders. Running records of text reading at the three stages were collected from the teachers. Since struggling learners such as those in Reading Recovery follow very different paths and trajectories of progress when provided with instructional interventions (Clay, 1993b), it was considered inappropriate to measure all children at specific time segments. As an example, one child might still be reading below text level 5 in the same amount of time that it takes another child to achieve a much higher level. Strategy development would not be as evident yet for the former child. Possible strategy knowledge at the different levels are described below.

INITIAL TESTING

Performance on initial testing provided a baseline for observations. Running records of the text reading samples from *An Observation Survey of Early Literacy Achievement* (Clay, 1993a) were collected. At initial testing, all of the children were asked to read the first three books used in the survey for continuous text reading throughout the United States:

Where's Spot? (Level *B* if successful)

In this book, the child is asked to point to and read the words *no, no, no*, after having heard the teacher read, but not point to, *no* or *no, no* on other pages. Whether a child is successful with this task is related to his or her understandings about the print containing the message and the necessity of having a one-to-one match between spoken and written words.

A Bird Can Fly (Level 1, basal equivalent: readiness)

Hats (Level 2, basal equivalent: readiness)

In these two books, the child is asked to point to and read a repeating phrase after the teacher has pointed to and read the phrase on the first one or two pages. The child is also asked to read the final page independently. This task may provide information about the child's memory for the repetitive language structure, knowledge about reading as a sense-making task, and control of directional movement and one-to-one matching. There may be evidence of self-monitoring, cross-checking, and self-correcting, as well. These are inferred from behavioral evidence (e.g., rereading to self-correct).

SUCCESSFUL READING AT LEVEL 5

At this level, children must begin to rely more on using all sources of information (i.e., meaning, structure, and visual) for problem solving rather than relying heavily on the repetitive structure of the language and the predictability of the text patterns. They must have emerging strategies for detecting and correcting error and for problem solving novel words. This level often represents a point where children must shift from using mostly language cues to paying more attention to visual information.

SUCCESSFUL READING AT LEVEL 10

Children generally cannot be successful at level 10 unless they have all early strategies under control including self-monitoring, cross-checking, searching for information, and self-correcting er-

rors; they must have flexible control over selection of strategic processes to reach their goals, the integration of information sources, and strategies for maintaining fluency.

Analysis of Running Records of Text Reading

For an appropriate amount of problem solving or "reading work" (Clay, 1991, 1993b) to be evident in children's oral reading, there must be sufficient amounts of accurate responding. For this reason, all running records collected for analysis were within the 90%–94% accuracy range. The purpose of the analysis was to determine if the children were using strategies for detecting and correcting error and for problem solving difficult words. Since one cannot see what is taking place "inside the head" where strategies are initiated and carried out, one must make inferences from outward behaviors (i.e., evidence) produced by the children.

These behaviors included *any attempt* made to confirm or to problem solve a response. Therefore, this included both successful and unsuccessful attempts, and errors that were detected and those which were not. It was recorded as an unsuccessful attempt if the child was unable to generate a response and the teacher told the child the word because it represented an inability to problem solve the word. In general, a "teacher told" is given when a child waits too long, presumably problem solving "underground" unsuccessfully or makes several unproductive attempts after which the teacher intervenes, assuming the child cannot solve the word independently. Note that the only intervention a teacher may make during a running record is to tell the child the word. He or she cannot give any prompts that would help the child solve the word so the child's independent problem solving can be ascertained.

Every attempt was analyzed separately, including an assumption about the cue sources used (i.e., meaning, structure, and visual information), and the strategic processes of problem solving were hypothesized from the behavior. Note that a word was considered a "target word" or "instance" if there was obvious work to get at the word, even if the work involved a meaningful substitution, indicating the child searched meaning and perhaps structure to render an attempt, or hesitated too long.

The following describe the target word and the various strategies that were hypothesized:

- Target word
  This is the word that serves as the source of the child's "reading work" or processing (i.e., problem solving, self-correcting, etc.).
- Behavior/Attempt
  This is an element of evidence that allows us to hypothesize about what strategies and information sources the child was using. Several attempts may be associated with one target word. *Each* attempt is analyzed separately. If the teacher intervened and told the child the word, this was also considered an attempt because the word represented evidence that the child was unable to generate an attempt based on the information sources being used.
- Self-monitoring
  This is evidence of the child's realization that something is wrong. It involves such things as repeating a word, rereading, self-correcting, trying another word, appealing for help, etc. In other words, a child is self-monitoring if he or she is aware of a mistake or problem and not self-monitoring when a mistake is ignored.
- Cross-checking
  This means that a child is cross-checking one source of information against another to self-monitor or problem solve. Evidence of this would include instances where the child self-corrected, tried another word, repeated a word or phrase *after a wrong response*. It generally indicates the child realizes there is something wrong and tries to resolve it by checking the source he or she used against another source (e.g., meaning cue against visual cue).
- Self-correcting
  This is evident when a child corrects a wrong response. It may happen immediately (i.e., right after the response) or it may happen during a rereading (i.e., when the child rereads a phrase or sentence and corrects the response at the same time).
- Rereading to confirm a response
  This involves a child simply rereading in order to confirm that what he or she said made sense, looked right, etc. It often occurs after the child has self-corrected or after the teacher has "told" the child the word because it confirms the response by hearing it again in fluent reading.

- Rereading to problem solve a response
  This involves a child using the rereading or repetition of a word, phrase, sentence, or page as a means toward problem solving a word.
- Appealing to the teacher for help
  This is when the child appeals for help with the word.
- Unsuccessful attempts
  This is evidence the child has engaged in "reading work" but has been unsuccessful. It may involve several repetitions, several substitutions, or be followed by a "told" given by the teacher.
- Information sources used
  This involves the evaluator's hypothesis regarding which information sources a child used when making an attempt or self-correcting an error. It could be any of the following: meaning (M), syntactical structure (S), and/or visual information (V), separately or in combination.

For the analysis of strategic processing, a format developed by the author was used to extend traditional running record analysis beyond the daily analysis conducted by Reading Recovery teachers. Figures 1 and 2 include samples of this strategic processing analysis. In these specific examples, two children who are reading at instructional levels have demonstrated drastically different levels of processing and outcomes. For example, the child in Figure 1 tends to wait for help from the teacher rather than attempting to problem solve the word and did not detect and correct the errors of *in* or *on*, despite the structural incongruence, or *sick* for *ill*, despite the dissonance of visual information with meaning. Independent problem solving strategies at difficulty are not in place, nor is the child consistently self-monitoring at error.

The child in Figure 2 used meaning and structure to make attempts at words, and then after apparently cross-checking the language predictions with visual information (i.e., self-monitoring), she consistently self-corrected errors. This child used rereading to problem solve and revise attempts and was fairly independently working to make all sources of information match.

Running records were analyzed by pairs of trained scorers after initial instruction on the procedures. Again, the trained scorers were analyzing running records for evidence of the strategies

Ice Cream

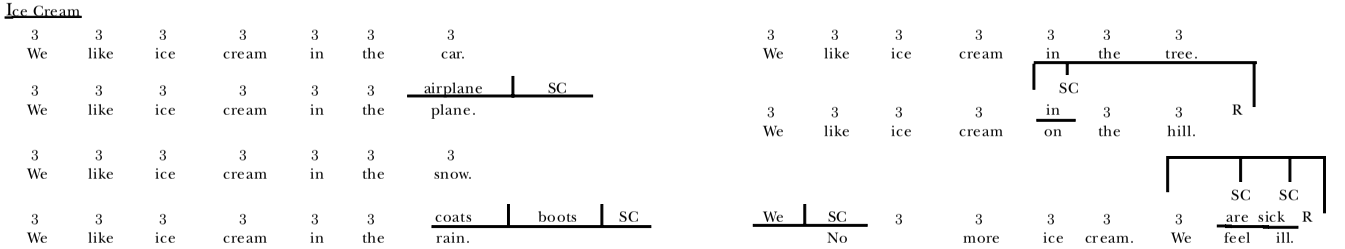
We	like	ice	cream	in	the	car.
We	like	ice	cream	in	the	plane.
We	like	ice	cream	in	the	snow.
We	like	ice	cream	in	the	rain.
We	like	ice	cream	on	the	hill.

No more | T ice cream. We feel | T sick ill.

Ice cream — Child's Strategic Processing — Teacher Intervention

Target Word and Attempts	Searching for info	Self-monitoring	Cross-checking	Rereading to problem solve	Rereading to confirm	Self-correcting	Appealing for help	Info used	Told	Encouraged to try
ON										
in	X							MSV		
MORE									X	
FEEL									X	
ILL										
sick	X							MS		

FIGURE 1. Analysis of children's strategic processing: Child # 2 with weak processing.



Ice cream — Child's Strategic Processing — Teacher Intervention

Target Word and Attempts	Searching for info	Self-monitoring	Cross-checking	Rereading to problem solve	Rereading to confirm	Self-correcting	Appealing for help	Info used	En couraged Told	En couraged to try
PLANE										
airplane	X						MS			
SC	X	X	X			X		MSV		
RAIN										
coats	X							MS		
boots	X	X	X					MSV		
SC	X	X	X		X			MSV		
ON										
in	X							MSV		
<<<R/SC	X	X	X	X		X	MSV			
NO										
we	X							MS		
SC	X	X	X			X		MSV		
FEEL										
are	X							MS		
<<<R/SC	X	X	X	X		X	MSV			
ILL										
sick	X							MS		
<<<R/SC	X	X	X	X		X	MSV			

FIGURE 2. Analysis of children's strategic processing: Child # 1 with strong processing.

described above. Inter-scorer reliability was high (approximately 90%) and all disagreements were resolved in conference.

Results and Discussion

Quantitative Analyses

Means and standard deviations that were used for the examined differences in *emergent reading scores* are reported in Table 1. The entry scores are reported as session 1, text level 5 scores as session 2, and text level 10 scores as session 3 in order to illustrate gains. An analysis of variance (ANOVA) indicated no main effect on growth in strategy use or strategic processing by the children in this study with regard to emergent reading level. The fact that emergent reading score, which measures children's experience with stories prior to beginning the program, has no effect on chances for success means that one cannot predict who will succeed or fail based on where they are when they begin. This suggests that children have an equal chance of succeeding in this early intervention literacy program regardless of their competencies at the start of their tuition. It seems that Reading Recovery instruction levels out children's chances for success.

The mean gain scores for strategy use (e.g., self-monitoring, cross-checking) are presented in Table 2 and are reported as proportions of the number of behaviors noted on running record analyses. The mean gain scores for the number of behaviors (i.e., attempts the child made at the target word) are also reported in Table 2, but they represent a proportion of the number of target words, indicating how many attempts were made. Note that two children, Greg and Paul had proportions greater than 1.0. This was because they made such a high number of attempts per target word. A repeated measures ANOVA was conducted to explore the children's development of the use of problem-solving strategies, as well as the outcome of their attempts. This analysis, reported in Table 3, revealed that the children as a group significantly increased in their use of all strategies as suggested by behavioral indicators (e.g., substitution attempts, rereading, etc.) and decreased the number of unproductive attempts. Specifically, as the children participated in the Reading Recovery experience, they: (a) increased in the number of attempts to solve words ($F(2, 32) = 15.70$,

TABLE 1. Means and Standard Deviations Used for Gain Scores by Subpopulation: Emergent Reading Category

Emergent Reading Category	BR		SM		CC		SC		RRC		RRPS		AP		UA	
	m	sd	m	sd	m	sd	m	sd	m	sd	m	sd	m	sd	m	sd
Session 1																
No Story (n = 8)	1.050	.120	.007	.021	.007	.021	.007	.021	.000	.000	.000	.000	.000	.000	.990	.021
Oral-Like (n = 7)	1.086	.227	.054	.142	.054	.142	.054	.142	.000	.000	.018	.047	.000	.000	.946	.142
Written-Like (n = 2)	1.071	.101	.062	.088	.062	.088	.062	.088	.000	.000	.062	.088	.000	.000	.937	.088
Session 2																
No Story (n = 8)	1.460	.520	.539	.206	.134	.091	.117	.106	.235	.245	.132	.119	.085	.128	.440	.169
Oral-Like (n = 7)	1.647	.479	.484	.198	.304	.094	.213	.079	.184	.105	.107	.095	.018	.030	.645	.152
*Written-*Like (n = 2)	1.942	.672	.480	.101	.359	.069	.257	.022	.074	.041	.132	.058	.034	.049	.617	.092
Session 3																
No Story (n = 8)	1.620	.350	.463	.178	.145	.107	.134	.079	.163	.059	.096	.044	.052	.043	.499	.132
Oral-Like (n = 7)	1.575	.440	.540	.186	.318	.204	.224	.163	.104	.069	.104	.046	.032	.042	.641	.179
Written-Like (n = 2)	1.877	.420	.554	.206	.334	.048	.203	.141	.141	.112	.151	.126	.040	.057	.576	.108

Note. BR = Behaviors/Attempts; SM = Self monitoring; CC = Cross-checking; SC = Self-correcting; RRC = Rereading to confirm; RRPS = Rereading to problem solve; AP = Appealing for help; UA = Unsuccessful attempt; m = Mean; sd = Standard deviation. Behavior/Attempts are reported as a proportion to number of target words that indicated reading work. Strategic processes and unsuccessful attempts are reported as proportions to number of behaviors/attempts. Session 1 reflects "entry to the program" scores.

TABLE 2. Means for Gain Scores from Session 1 Through Session 3 for Behaviors/Attempts, Strategic Processing and Unsuccessful Attempts

Child	# Target Words	BR	SM	CC	SC	RRC	RRPS	Ap	UA	TT
Elana	46	.42	.37	.15	.15	.15	.07	.00	–.26	.04
Karen	37	.65	.27	.15	.15	.13	.04	.04	–.48	.08
Mark	40	.60	.42	.13	.04	.21	.08	.04	–.54	.04
Linda	53	.44	.28	.24	.18	.06	–.06	.00	–.22	.00
Thad	41	–.05	.11	–.18	–.18	.19	.04	.10	–.08	.10
Jerry	14	.67	.72	.31	.19	.19	.16	.06	–.44	.06
Jake	33	.94	.71	.13	.10	.23	.10	.10	–.48	.10
Greg	48	1.17	.70	.30	.10	.22	.24	.08	–.50	.08
Beth	46	.35	.65	.43	.39	.09	.09	.00	–.48	.04
Tim	36	.74	.27	.15	.12	.03	.12	.06	–.36	.15
Ted	33	.81	.55	.17	.03	.14	.07	.07	–.45	.21
Kiran	7	.82	.55	.00	.15	.05	.15	.05	–.30	.05
Paul	35	1.29	.62	.46	.18	.13	.05	.00	–.51	.10
Carrie	18	–.11	.38	.00	.00	.13	.13	.13	–.63	1.00
Jeffrey	25	.46	.37	.21	.21	.21	.05	.00	–.37	.26
Jackie	18	–.14	.83	.67	.50	.00	.17	.00	.00	.33
Robbie	19	.55	.24	.18	.18	.18	.06	.00	–.71	.35

Note. BR = Behaviors/Attempts; SM = Self monitoring; CC = Cross-checking; SC = Self-correcting; RRC = Rereading to confirm; RRPS = Rereading to problem solve; AP = Appealing for help; UA = Unsuccessful attempt; TT = Teacher Told. Behavior/Attempts are reported as a proportion to number of target words that indicated reading work. Strategic processes and unsuccessful attempts are reported as proportions to number of behaviors/attempts.

$p < .000$), but decreased in the number of unsuccessful attempts (F (2, 32) = 63.68, $p < .000$); (b) engaged in more self-monitoring (F (2, 32) = 63.04, $p < .000$) and cross-checking (F (2, 32) = 18.65, $p < .000$); (c) self-corrected more miscues (F (2, 32) = 13.72, $p < .000$); (d) increased their use of rereading as a strategy to confirm responses (F (2, 32) = 14.08, p < .000) and to problem solve difficult words (F (2, 32) = 14.22, $p < .000$); and (e) increased slightly in the use of appealing to the teacher for help with words (F (2, 32) = 5.1, $p < .02$).

The greatest gain appears to be in self-monitoring, where the children increased their monitoring strategies by 47%, from 3% to 50% for each behavior noted. Part of this growth, of course, is explained by the fact that use of any of the other strategies, such as rereading to confirm a response or self-correcting an error, represents self-monitoring. However, this feat is still worthy of attention and consideration because each instance of monitoring suggests the child engaged in strategic processing such as: (a) recognizing dissonance, (b) searching further to make information sources match, (c) confirming a response, and (d) making an attempt such as a language prediction followed by a check on the visual information, rather than simply stopping. This sort of reader-initiated processing as seen in the example below documents dramatically the possibility that during the children's participation in Reading Recovery they progress from merely inventing text (i.e., no self-monitoring of mismatches in information sources) to not being satisfied with responses that signal something is wrong or to making confirming checks on correct responses. It suggests active construction and a sense of responsibility on the part of the children; these represent important signals of self-regulation.

In addition to significant gains in self-monitoring, there were increases in all other strategies that indicated problem solving: (a) cross-checking of information source—20%, (b) self-correction—14%, (c) rereading to confirm—13%, and (d) rereading to problem solve—9%. The strategy of appealing for help, one that good readers use as well, may signify a switch from *self*-regulation to *other*-regulation and increased by only 4%. Taken together, these increases in monitoring and problem solving provide strong evidence that this group of children were on the road to becoming strategic readers, albeit at varying degrees of success and with different paths and patterns of learning.

TABLE 3. Repeated Measures Analysis of Variance (ANOVA) Results on Mean Scores for Behaviors/Attempts, Strategic Processing and Unsuccessful Attempts.

	BR		SM		CC		SC		RRC		RRPS		AP		UA		TT	
	m	sd	m	sd	m	sd	m	sd	m	sd	m	sd	m	sd	m	sd	m	sd
Session 1																		
Entry	1.067	.161	.033	.094	.033	.094	.033	.094	.000	.000	.015	.041	.000	.000	.967	.094	.000	.000
Session 2																		
Level 5	1.594	.508	.509	.186	.231	.128	.173	.102	.195	.182	.122	.099	.051	.094	.545	.179	.172	.175
Session 3																		
Level 10	1.632	.348	.506	.177	.239	.170	.179	.127	.136	.070	.106	.054	.043	.042	.567	.159	.176	.236
Significance																		
	$f(2.32) = 15.70$ $p < .000$		$f(2.32) = 63.04$ $p < .000$		$f(2.32) = 18.65$ $p < .000$		$f(2.32) = 13.72$ $p < .000$		$f(2.32) = 14.08$ $p < .000$		$f(2.32) = 14.22$ $p <. 000$		$f(2.32) = 5.100$ $p < .000$		$f(2.32) = 63.68$ $p < .000$		$f(2.32) = 6.985$ $p < .003$	

Note. BR = Behaviors/Attempts; SM = Self monitoring; CC = Cross-checking; SC = Self-correcting; RRC = Rereading to confirm; RRPS = Rereading to problem solve; AP = Appealing for help; UA = Unsuccessful attempt; TT = Teacher Told; m = Mean; sd = Standard deviation. Behavior/Attempts are reported as a proportion to number of target words that indicated reading work. Strategic processes and unsuccessful attempts are reported as proportions to number of behaviors/attempts.

The following example is illustrative of the independent strategic problem solving of children who were operating at this level and trying to make all information sources match:

TEXT
Pussy Cat, Pussy Cat,
what did you wear?
CHILD
Pussy Cat, Pussy Cat,
where (for what) *did you go* (for wear) *go* (repeats to check response) *wear* (self-corrects) *What did you wear?* (rereads entire sentence and self-corrects the earlier miscue, where for what, now that the meaning is clear.)

Another significant finding is that the children, as a group, decreased the proportion of unsuccessful attempts they made for each target word, or word indicating problem solving, by 40%, from 96% to 56%. In other words, fewer of their obvious attempts were unsuccessful. This could suggest that they were using and checking information sources more accurately before they spoke, or that their problem solving was perhaps more covert and unsuccessful attempts were withdrawn from view. However, one needs to consider that this variable could be affected by the number of times the teacher intervened and told the child the word since a decrease in number of unsuccessful attempts *could* represent concomitant increases in "teacher tolds." In fact, that appears to be the case for a few children and could explain the 17% increase in teacher interventions. For example, Carrie decreased her unsuccessful attempts by 63%, while at the same time increased the number of teacher interventions by 100%. This is not a general trend, however; consider that Mark demonstrated a decrease in unsuccessful attempts with only an 8% increase in teacher interventions.

Qualitative Analysis

The above analyses explain positive trends in children's development of strategic processing as a group, however, a closer look at individual children's change over time provides insight into their paths of progress and may even provide information about the quality of children's strategic processing which could inform teacher decision-making. Here I would like to examine the differences in processing of two children who both were successful at

level 10 in terms of accuracy and self-correction rate, but who were qualitatively very different in terms of independent, strategic problem solving.

GREG

By the time Greg had reached level 10 at session 3, he had made significant gains in self-monitoring (70%) and cross-checking (30%); he had increased in the use of rereading to problem solve (24%) and to confirm responses (22%). These gains suggest that Greg was taking charge of his own problem solving: monitoring, cross-checking information sources, evaluating, searching, predicting, confirming, etc. Greg was, in fact, being strategic in his processing. Over time he had only an 8% increase in "teacher tolds." An analysis of his problem-solving attempts indicated that he was using language (meaning and structure) 38% of the time, a combination of meaning, structure, and visual information 33% of the time, and visual information exclusively 29% of the time.

A close inspection of his attempts, indicates that, in general, he would approach unknown words by making language predictions (e.g., *said* for *called*) about half of which were visually similar at the initial letter (e.g., *wait* for *will*). He regularly caught the dissonance between language and visual cues, and often self-corrected immediately (e.g., *up* for *with* then *with*) or upon rereading to problem solve as he did with *and* for *Dad* in the example below.

When he attempted to solve words using visual analysis only, which was not as often, he was not as successful and these times generally ended in an appeal and an intervention by the teacher. These patterns of problem solving suggest that he generally engaged in strategic processing, using language quite successfully and could detect error consistently. When his problem solving focused at the visual level he was not as productive, and suggested that at these points, he was not bringing meaning to the process effectively. However, once he was given the word by the teacher, he would always reread to hear the language again to establish the meaning, often self-correcting during the rereading a previously incorrect word, as he did with *shut* in the example below. At level 10, Greg had many strategies in place to continue to learn how to problem solve as he read increasingly difficult texts.

TEXT:
Mom! Dad! Come for a swim!
GREG:
Mom! And (language prediction for *Dad*) *And* (repeats to check response) *Mom! Dad!* (rereads to establish language and self-corrects) *Come for a swim!*
TEXT:
"I am coming," said Mom,
and she shut her eyes.
GREG:
"I am coming," said Mom, and she set (language prediction for shut) *set* (repeats to check response) */s/ /h/ /ut/* (attempts letter to sound analysis) *set* (returns to original language substitution) *her /e/ /y/* (attempts sound analysis for eyes and appeals for help—teacher told) *"I am coming," said Mom, and she shut her eyes* (repeats entire page to establish meaning and to self-correct shut which he now can problem solve because of the additional meaning that eyes bring to the construction.

ROBBIE

At level 10, every error that involved a word substitution was visually similar and fit with meaning and structure cues and these accounted for 43% of the errors. However, 57% of the errors involved only visual information sources (e.g., */cr/-/cr/-* for *crafts/* teacher told) and most often resulted in teacher intervention. In fact, 54% of the behaviors/attempts that could be analyzed resulted in the teacher telling Robbie the word, and 36% involved no attempt by Robbie prior to the teacher intervention after a wait period as in the examples below. A closer inspection of Robbie's problem solving strategies and ability to detect and correct error indicates a lesser degree of independent, strategic processing than Greg. For example, at level 10, only 36% of the errors indicated self-monitoring and Robbie had gained only 24% overall in self-monitoring as a strategy.

At a gain of only 6%, Robbie was not using rereading as a means of problem solving consistently or effectively either and this is problematic since such a strategy provides additional attention to meaning and structure to contribute to the problem solving. It seems that Robbie had developed moderately successful strategies for detecting and correcting error, but was not skilled yet in problem solving difficult words using a balanced approach of paying attention to all information sources. He does not have the same level of inner control as demonstrated by Greg.

TEXT:
When we had "show and tell."
ROBBIE:
We (for when) we (for we), (rereads and self-corrects) *when we had* (no attempt for *show*–teacher told) and /t/-/t/-/t/- (for tell–teacher told)
TEXT:
We all yelled.
ROBBIE:
We (no attempt for all–teacher told) (no attempt for yelled–teacher told).

Conclusions and Implications

This study, which was a component of a larger study that investigated the contributions Reading Recovery instruction makes to literacy development (see Cox, Fang, & Carpenter, 1995; Cox, Fang, & Schmitt, 1995) answers important questions about children's progress in strategic processing and ways to evaluate it for instructional decision-making. Because this was an exploratory investigation with a small number of students and no experimental design that included a control group, any conclusions must be drawn cautiously and causality cannot be claimed. Indeed it was the purpose of this study to examine and describe strategic processing as it developed. However, the findings that emerge from this study clearly suggest that these children who began the school year as the lowest achievers have begun, by text level 10, to develop literacy strategies that could result in independent, strategic processing. Extended analysis of their running records of text reading suggests they are developing ways to detect and correct errors and to problem solve at difficulty.

Though not *provable*, it is *conceivable* that Reading Recovery instruction contributed to these gains simply because the lowest achievers in a first grade class, who begin instruction with literally no strategy use, would not be expected to make these accelerated gains while participating in the lower reading group in the classroom. Such a finding is consistent with Schmitt's (1998) analysis of first-grade children's metacognitive knowledge. Using a Metacognitive Interview to study the development of metacognitive knowledge in children during Reading Recovery instruction in comparison to their average-achieving peers, she found that children participating in Reading Recovery instruction generally began the year with lower or roughly equal metacognitive knowledge

of reading and writing tasks and strategies in comparison to the average cohort children. However, the Reading Recovery children achieved not only accelerated growth in metacognitive knowledge as predicted, but they also achieved task and strategy knowledge at levels above their counterparts, thereby surpassing them. These results suggest that children learn more than how to perform reading and writing strategies during the intervention; they also develop metacognitive knowledge about tasks and strategies as measured in the interview at rates and with outcomes that exceed development in their average achieving cohort. The higher achievement levels were unexpected and suggest that the development of metacognitive knowledge is a key aspect of Reading Recovery instruction, at least at the beginning of the year.

Further, this study sought to determine if gains made in Reading Recovery were affected by emergent reading level and no main effects were found. Although these findings need to be considered with caution because of the low number of children, it is promising that perhaps all low-achieving children can benefit from this individual instruction program regardless of where they begin their tuition. This suggests the instruction can be successful no matter the level at entry and supports the notion that one cannot predict children's success or failure in Reading Recovery based on entry skills.

And finally, this study investigated whether an extended evaluation format for running record analysis developed by the author could provide useful information about children's progress toward independent, strategic reading. It seems clear that this in-depth analysis of the children's records can answer questions about whether or not children are achieving success (i.e., 90%+ accuracy) on text reading by employing independent strategies for detection and correction of errors and problem solving at difficulty or still relying on the teacher for too much help in processing. This is quite clear in the comparison of Greg's and Robbie's records. Although teachers analyze children's running records daily, the focal point of the analysis is often on the information sources used by the children in making, detecting, and correcting errors. Such an extended analysis as this one, over time, might inform teacher decision-making. For example, Robbie's teacher could make better decisions about fostering independence and

keeping the text reading at a level that would allow him to learn about and to control literacy strategies independently.

The results indicating that children develop literacy strategies while participating in Reading Recovery were not unexpected, however, this study generated some interesting new findings about children's strategy use and independent processing and raised questions for further study. For one, an analysis of specific strategies and their interrelationships, as well as their impact on progress would provide useful information for instructional decision-making. Further, the link between the development of metacognition and strategy use (e.g., Cox, Fang, & Schmitt, 1995; Schmitt, Younts, & Hopkins, 1994) needs to be explored because it, too, may explain differences in children's accelerated growth in Reading Recovery as well. Moreover, the insights gained about Reading Recovery instruction can be generalized and applied in other instructional settings such as small group and whole class instruction. Some professionals have suggested that aspects of Reading Recovery instruction should be incorporated into other settings (e.g., Spiegel, 1995) and research such as this might contribute to our understandings of the critical aspects that make Reading Recovery such a successful early literacy intervention.

References

Allington, R. L., & Walmsley, S. A. (1995). Redefining and reforming instructional support programs for at-risk students. In R. L. Allington & S. A. Walmsley (Eds.), *No quick fix: Rethinking literacy programs in America's elementary schools* (pp. 19–44). New York: Teachers College Press.

Askew, B. J., Fountas, I., Lyons, C. A., Pinnell, G. S., & Schmidt, M. C. (1998). *Reading Recovery review: Understandings, outcomes, and implications.* Columbus, OH: Reading Recovery Council of North America.

Clay, M. M. (1979). *The early detection of reading difficulties.* Portsmouth, NH: Heinemann.

Clay, M. M. (1991). *Becoming literate: The construction of inner control.* Portsmouth, NH: Heinemann.

Clay, M. M. (1993a). *An observation survey of early literacy achievement.* Portsmouth, NH: Heinemann.

Clay, M. M. (1993b). *Reading Recovery: A guidebook for teachers in training.* Portsmouth, NH: Heinemann.

Clay, M. M., & Cazden, C. B. (1990). A Vygotskian interpretation of Reading Recovery. In L. C. Moll (Ed.), *Vygotsky and education: Instructional implications and applications of sociohistorical psychology* (pp. 206–222). New York: Cambridge University Press.

Cox, B. E. (1994). Young children's regulatory talk: Evidence of emerging metacognitive control over literary products and processes. In R. Ruddell & M. Ruddell (Eds.), *Theoretical models and processes of reading (4th ed.)*. Newark, DE: International Reading Association.

Cox, B. E., Fang, Z., & Carpenter, S. (1995, December). Examining changes in structural patterns used by children during Reading Recovery. Paper presented at the annual meeting of the National Reading Conference, New Orleans, LA.

Cox, B E., Fang, Z., & Schmitt, M. C. (1995, December). At-risk children's metacognitive growth during Reading Recovery experience: A Vygotskian interpretation. Paper presented at the annual meeting of the National Reading Conference, New Orleans, LA.

Paris S. G., Wasik B., & Turner, J. C. (1991). The development of strategic readers. In R. Barr, M. L. Kamil, P. Mosenthal, & P. D. Pearson (Eds.), *Handbook of reading research, Volume II* (pp. 609–640). New York: Longman.

Rowe, D. R. (1989). Preschoolers' use of metacognitive knowledge and strategies in self-selected literacy events. In S. McCormack & J. Zutell (Eds.), *Cognitive and social perspectives for literacy learning; and instruction* (pp. 65–76). Chicago: National Reading Conference.

Schmitt, M. C. (1988). The effects of an elaborated directed reading activity on the metacomprehension skills of third graders. In J. E. Readence & R. S. Baldwin (Eds.), *Dialogues in literacy research.* Chicago: National Reading Conference.

Schmitt, M. C. (1998, December). Development of metacognitive knowledge regarding self, task, and strategy variables during Reading Recovery program instruction. Paper presented at the National Reading Conference, Austin, TX.

Schmitt, M. C., Younts, T., & Hopkins, C. J. (1994, December). From "at-risk" to strategic, self-regulated learners: Reading Recovery from Vygotskian and metacognitive perspectives. Paper presented at the annual meeting of the National Reading Conference, San Diego, CA.

Spiegel, D. L. (1995). A comparison of traditional remedial programs and Reading Recovery: Guidelines for success for all programs. *The Reading Teacher, 49,* 86–96.

Sulzby, E. (1985). Children's emergent reading of favorite storybooks: A developmental study. *Reading Research Quarterly, 20,* 458–481.