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CHAPTER 9

From Observation and Analysis to Creating Model Activity Systems

The research discussed in Chapter 8 featured two basic strategies for dealing with the kinds of complex, multi-person interactions that characterize activity in what psychologists refer to as everyday life. The first was to use everyday events as the inspiration for experimental models (e.g., the Vai work on literacy or Beach's study of bartender's remembering); the second was to observe behavior in the settings of interest and analyze it in terms of an appropriate formalism (e.g., speech act theory or the rules of arithmetic, a formal-psychological recall task).

Despite differences among them, those studies can be considered "basic research" in that they did not involve deliberate application of theoretical principles to change the lives of the people who participated in them. To be sure, our rationale in each case included social concerns: the work on Vai literacy followed a long tradition of interest in promoting economic and educational development in rural Africa; the comparison of children in classrooms and supermarkets addressed concerns over language and cognitive development among inner city children; the work on ecological validity was directly tied to questions about education.

The studies to be described in this and the next chapter take the additional step of using theoretical principles to guide the construction of activities deliberately designed for educational purposes. Consequently, within the traditional paradigms used by psychologists, each can be considered an example of "applied cultural psychology." However, the standard division of psychological research into applied and basic branches does not apply in the case of cultural-historical psychology. As noted in Chapter 4, the Russian cultural-historical psychologists contended that the ability to apply their principles in practical settings provided essential

evidence for their theoretical analysis.

The two studies I discuss in this chapter bring my work much closer to a theory-and-practice methodology. The first involved us in a collaboration with a teacher team to create curricula-as-cognitive -tasks. It can be considered a "transitional" approach in that responsibility for implementing our ideas rested with the teachers. The second study led us back into afterschool time and an interest in the remediation of learning disabilities. In this case, we made the decisive move of taking full responsibility for implementing the activities we designed and for the welfare of the children who participated.

Making Same Tasks Happen in Different Settings

Our work with afterschool clubs impressed upon us the close connection between psychologists' ability to specify cognitive processes through experiments and the social arrangements of formal schooling. Cognitive tasks do not "just happen"; they are made to happen in joint activity among people. They are made to happen in particular ways in places called schools where children answer teacher questions and take tests. Under such conditions, the definition of a task is relatively straightforward because classroom interactions conform, more or less, to the constraints that characterize cognitive psychological experiments.

This line of reasoning suggested that our search for cognitive tasks happening in settings had gone about matters the wrong way. Instead of seeking to discover cognitive tasks it would have been more sensible for us to make the same task happen in different settings and then observe how it is reassembled, transformed, dispersed, or destroyed in the course of the activity of which it is a part. That way we would have a better chance of specifying the social work that had gone into creating the task in the first place

The basic strategy we adopted at the outset was to work collaboratively with teachers to create curricular units that embodied cognitive tasks.¹ During the course of two years we constructed and implemented experimental curriculum units in science (electricity, animals, household chemicals), mathematics (long division), and social studies (Native American Indians). Within each unit we arranged for "the same tasks" to occur in a variety of social circumstances: large group lessons, small-group activities, tutorials, and an afterschool club-like activity.

The contents of each unit implemented a part of the state-mandated educational objectives for 3/4th graders. For example, the household chemicals cycle was chosen as a way to implement a natural sciences requirement. It was suggested by a teacher who was concerned about spontaneous fires from mixing cleaning solvents and other health hazards in the home. We were delighted with the idea because it mapped directly onto a well known Piagetian task.

We conceived of the common logical schema shared by implementations of the curriculum in different instructional contexts (small group, one on one tutorials, etc.) as "problem isomorphs" (Gick and Holyoak, 1980). Ordinarily study of such isomorphs is restricted to a single social context, the experimenter-subject relationship, and interest is focused on variations in problem content. In our case, variations across social structuring of the task for problems of the same logical structure was of paramount interest, although we also varied the content of tasks in some cases.

Our analysis of the Piagetian combination of variables task illustrates the procedures and

¹ The "we" in this case included Denis Newman and Peg Griffin who took day to day responsibility for the project. The teachers who made this work possible were Marilyn Quinsaat, Kim Whooley, and Will Nibblet. Bud Mehan, Margaret Riel, Sheila Broyles, and Andrea Pettito made important contributions to different aspects of the project.

the kinds of results that this strategy yielded. In the one-on-one, adult-child version of the task, the children were presented with stacks of little cards. The cards in each stack contained the picture of a different movie or TV star. Starting with four stacks, the child was asked to find all the ways that pairs of movie stars could be combined (e.g., to find all possible pairs of cards). When the child had completed as many pairs as possible, the adult instituted a bit of training by asking the child to check to see if any pairs were missing, and modeled a systematic checking procedure ("Do you have all the pairs with Mork" "Do you have all the pairs with Elvis," etc.). When the checking was completed, the stack of cards was put back together and a fifth stack was added. Again the child was first asked to make all the possible pairings and then coached in the checking procedure if such coaching was needed. When the child completed the task with 5 stacks of cards, a 6th stack was added and the procedure repeated.

We scored performances for any instance of a child going through part or all of the pairings involving a particular card, such as 1&2, 1&3, 1&4. As would be expected for children this age, few children used a systematic logical procedure without help, although a majority began to display systematic strategies for pairing cards after they had been through the checking procedure.

These same children also participated in a small group activity where 3-4 children went to a work area at the back of the room where they were asked to find combinations of chemicals in beakers. Each group was given four beakers containing colorless solutions numbered to make them easily identifiable. They were also given a rack of tubes, a sheet of paper with two columns marked "Chemicals" and "What happened?" on which they were urged to record their results. The chemicals were chosen so that each combination would produce a distinctive result. After the teacher got one of the children to read the instructions aloud, she told the them to investigate

all the possible pairs without duplicates and busied herself with paperwork to make it clear that the children should proceed on their own.

Because the children who completed the movie star tutorial also completed the chemical combinations task, we could compare their performances across settings to see if they responded in the same way to the tasks in the two settings. But here the different social contexts of the tasks made themselves clearly felt.

In the two person tutorial, the procedures divided the cognitive labor relatively neatly between the child and adult so that for each move in the problem it was possible to say either that the child did it on her own or she was helped in varying degrees by the experimenter. But in the multi-child chemical pouring task, matters were considerably more complicated.

Since there was no imposed division of labor, it was often impossible to determine how much each child contributed to, or understood about, the solution of the combinations task. For example, if one child was in charge of pouring and one child was in charge of recording, their interactions may not have revealed the understandings of the recorder). This difficulty follows directly from the additional freedoms allowed the children by the teacher and it confirms the difficulty of drawing conclusions about "same task in different settings" even when we make certain that the same task is there at the outset of the interaction. The normative constraints of the activity overwhelm the constraints of the task.

However, we also discovered that embedding the combination of variables task in a multi-person activity revealed an important aspect of the task that the standard procedure routinely obscured -- the children's discovery of the task goal. When finding all combinations of chemicals the children started out by addressing a problem that does not arise in the standard version of the task-- how to make sure that everyone gets a fair turn to test the reactions caused

by different combinations of chemicals. Only after a turn taking procedure and division of labor was worked out did the children turn their attention to the question of which chemicals to combine. Initially there is no evidence that the children are in fact oriented to the task of discovering all possible combinations of chemicals. Disputes were more likely to concern fair turn taking than the question of which chemical combinations had been attempted with what outcomes. Once the children solve the problem of social equity and have succeeded in testing several of the possible combinations, the task we were interested in (finding all possible combinations) arises as a result of the need to know if there are any more turns to be taken. In these circumstances the children spontaneously articulate their involvement of the task of finding all possible combinations because they need to communicate with their partners about the ongoing social order. By contrast, in the one-on-one sessions using combinations of cards tutorial , where we had excellent evidence about what parts of the adult-defined task the child fulfilled, we *never* obtained evidence that the child actually formed the goal intended by the adult. Children conformed to already- formulated (by the adult) goals by making pairs, but because it was (implicitly) the adult who was responsible for seeing the child reached the goal, the goal-formation part of the problem solving task did not arise as a social issue.

One additional event in this unit is worth mentioning because it affirms again the fragility of "same tasks" even when they make an appearance in a particular setting. Bud Mehan and Margaret Riel conducted an out-of-school version of the combination of variables task. The activity was called "The Back Pack Bears" and on the occasion in question, the children were engaged in the task of choosing meals for a hypothetical hike of several days duration. Each meal was to be a stew made up of two ingredients out of a possible 5 ingredients (carrots, beans, peas, etc.). The children start out to make different stews with different

ingredients, and for an instant the task of finding all combinations emerges. But it lasts no more than a few steps. The children picked the ingredients they liked best and ignored the rest of the task. This result came as no surprise given our experience in the cooking club, but it did serve as a reminder that the presence of "the task" in an activity must be jointly achieved and maintained.

Another part of the Household chemicals unit provided an important lesson about the conditions under which teachers make assessments of children's knowledge as part of classroom lessons. The lesson in question was designed to prepare the children for the chemical mixing task that I just described. In this lesson, given to 4-6 children at a time, the teachers intended to provide the children with hands-on experience mixing chemicals and record keeping. Initially the teachers expected the lesson to have a "wrap up" phase in which they would discuss the range of reactions the kids had created by the different combinations. They also knew they were preparing the kids for the fullblown experiment in mixing chemicals, where the subskills of mixing and recording would be necessary.

As a consequence of all these plans and the procedures for implementing them, when the lesson began, the goals of the teacher and the children were very different. The teachers were attempting to prepare the children for upcoming tasks. The children, of course, knew nothing of this future. They were simply excited to get their hands on real chemicals after hours of talking about them.

The lesson was structured so that the children first mixed two assigned chemicals and then wrote down what happened on the record sheet. They did this twice, for two different pairs of chemicals. The teacher oversaw and coached the work of each group as she deemed necessary.

We coded instances of teachers helping children in terms of two sub-tasks: mixing the

contents of the two beakers, then recording the results on the record sheet. Within each sub-task, we distinguished between low level help focused on local operations and a higher form that provided an overall view of the task. For each sub-task we scored the help children got into two categories: "Needed help" and "Cannot Tell if Needed Help" because in many cases, the teachers gave help when the child had not asked for it, but in circumstances where it might have been needed. For example, teachers would give help in response to a request about mixing the content of two beakers and then tell the children to record it before we could assess if the children needed a reminder to record or not. Results are shown in Figure 9.1

[Insert Figure 9.1 about here]

Several aspects of the results in Figure 9.1 are worth highlighting. First of all, note that a large proportion of the help in almost all cases is ambiguous in the sense that the child gives no discernable sign of a need for help. Second, the amount of higher level help decreased from the first to the second problem, indicating that children were learning the task. Third, the amount of help the teacher offered remained high even when the children didn't ask for it.

To get a better fix on what was happening in the "Can't say" cases, we interviewed the teacher. With respect to the overall high level of help she gave, the teacher said that this lesson was designed to prepare the students for the next lesson. She was particularly worried about the recording step because she had said less about it in her introductory instructions and because recording was going to be essential in the next lesson. With respect to the situations where she gave help that was not asked for she said that she was just reinforcing actions she assumed the kids could carry out anyway to make sure they would do the right thing in the next lesson. Here we see the principle of prolepsis, which I discussed in Chapter 7. The teacher's actions (and hence the children's experiences) are guided not by contingencies of the moment, but of

anticipated requirements for action in the future.

Of the many other interesting results from this project, I will mention only a case which elaborates directly on the central roles of ambiguity and prolepsis as systemic features of culturally mediated joint activity and the process of cognitive change. This curriculum unit was designed and implemented by Marilyn Quinsaat as teacher and Andrea Petitto as the researcher (See Petitto, 1985, or Newman, Griffin, & Cole, Chapter 6, for more details).

The cycle was designed to teach the process of long division to fourth graders who were encountering it for the first time. The lesson consisted of two phases, a demonstration in which the teacher carried out several long division problems on the board while individual children supplied parts of the solution, and a worksheet phase during which children solved problems on their own with teacher assistance when she thought it needed. The children were expected to know their "multiplication facts" ("7 times 6 equals 42") and simple division as reverse multiplication ("What times 7 is 42? 6"). In this lesson the teacher introduced a new goal for cases where there was a remainder, so simple division using multiplication facts would not work (for example, "7 goes into 46"). In such cases, she told the children, the "7 goes into 46" problem is solved "in the same way" as simple division by finding a number which, when multiplied by 7 produces a number "close to 46 except it doesn't go over" and then subtracting to find the remainder.

Even for people who know how to carry out the long division algorithm, such an explanation can be confusing. For children who are encountering the problem for the first time, even children who know their multiplication tables, simple division, and who have some experience with the idea of remainders from prior lessons involving manipulable objects, the procedure poses difficult challenges.

The difficulty of the uninitiated child's situation was brought home to me during a conference attended by several colleagues from Japan at which Andrea Petitto presented her analysis. She introduced her talk by saying that fourth graders seem to have a difficult time grasping the "gazzinta" relation, and then launched into an analysis of how teachers and children negotiated the instructional interactions around division problems which were supposed to result in children understanding and using the "gazzinta". Her explanation made perfect sense to me, since members of the research team had been discussing the work for some time, but the Japanese were baffled. Eventually, one of them raised his hand to ask for an explanation of this new concept, "gazzinta." Andrea was nonplussed. "Goes in to" she said, slowly and with exaggerated intonation, and then demonstrated the entire procedure for determining how often 7 gazzinta 46. Even then several of the Japanese remained confused. A conversation in a mixture of English and Japanese ensued, at the end of which it appeared that everyone understood the implications of their confusion for understanding the habitual circumstances facing school children encountering new concepts more rapidly than they can assimilate them.

The fourth grader encountering long division for the first time faces a far more difficult task than our Japanese colleagues who knew the concepts involved in division as well as the process of estimating the probable quotient. The child hears the word, gazzinta, and seeks, like the Japanese visitors, to figure out its meaning. But teachers do not say what "gazzinta" means. In fact, it probably is not possible to give an unambiguous explanation of gazzinta for someone who does not already understand the concept. "Gazzinta" involves an iterative estimation procedure that is a combination of multiplication and subtraction carried out on the number line.

Faced with the difficulty of explaining the concept of gazzinta, the teacher created a "sure fire" procedure that children could use to produce the correct answer if carefully followed.

Suppose that the problem is $3\sqrt{17}$. If a child did not figure out that 6 was a likely quotient with some prompting, the teacher told them to step through the multiplication table for the divisor ($1 \times 3 = 3$, $2 \times 3 = 6$, etc.). Often she put the requisite times table on the blackboard next to the problem the children were supposed to solve as backup. As she walked the children through several problems, they began to find shortcuts to the cumbersome, but certain, trip through the multiplication table. With practice, most of the children began to shortcut the labor of the sure fire procedure and some began to do what skilled adults do-- use their knowledge of the multiplication facts in a flexible manner to make rapid estimates and then fine tune their answers. However, few of the children exhibited such fluency during the experiment.

When the children began to catch on to what was being requested of them and the teacher no longer needed to resort to the written out times tables, we noticed a strange phenomenon. There were times when the teacher and a child might be talking about different parts of the same problem (for example, the teacher said something about the quotient, the child about the dividend) but there was no noticeable disruption in the conversation and the child arrived at a correct answer. It was as if the teacher and child were in close enough coordination, despite local discrepancies in the precise part of the problem they were referring to, to permit the action to unfold.

On the basis of these and similar observations in the other curriculum models, we were led to reconceptualize the notion of cognitive task. Given our initial conception of a cognitive task -- a goal and the conditions for achieving it-- there was no doubt that the tasks we created were pulled apart in a variety of ways depending upon the particular circumstances into which they were inserted. But this notion of a task now seemed inadequate to the diversity of interactions we observed. Not only do the conditions for achieving the goal change from

situation to situation and moment to moment within a situation, but the goal itself may disappear, reappear, and change. Moreover, it became clear that to talk about "the" task, given the different perspectives of different participants, was a significant problem. Even standardized psychological experimental tasks are interpreted differently by different participants; it is just that the interactions are set up so that only one "official" interpretation is accepted by the analyst. Within this framework, there is no category of "doing a different task." There is only doing more or less well on "the" task.

In place of the notion of a cognitive task as a fixed entity, we concluded that cognitive tasks are best thought of as strategic fictions that participants use as a means of negotiating a common interpretation of the situation. In this sense, a cognitive task plays the role that Nelson ascribed to scripts; it is an inter-personal, public, resource for coordinated action. There is no necessary one-to-one correspondence between the script considered as an interpersonal artifact and the script considered as internal cognitive representation.

At the end of our work with children in afterschool clubs described in Chapter 8 (p. 000), we had come away believing that ecological *invalidity* was built into the standard procedures of cognitive psychology. At the end of this project we arrived at a similar conclusion, now applied to the relation of basic psychological research to teaching practice. Psychologists who conduct diagnostic tests or learning experiments and teachers engaged in classroom instruction participate in markedly different forms of activity. Psychological-educational cognitive research has at its goal differential diagnosis of children's abilities and evaluation of teaching procedures that assume a one-to-one interaction between adult and child. If the child gets unhappy, she can leave the experiment and return to her classroom, where no negative sanction await. Teachers must deal with 25 or 30 children at a time. While teachers also need to diagnose children's

current levels of knowledge and skill, they must simultaneously create the conditions for increasing those skills. An issue like "giving too much help" during instruction is not likely to be important to a teacher. However, if the child gets discouraged and gives up, or if a child becomes upset and leaves the classroom, it will certainly be a source of problems for the teacher as well as the child. From this perspective, it is little wonder that teachers so routinely find the output of educational-psychological research to be invalid in the working conditions of their everyday lives.

From observation and analysis to responsibility for the activity: A Re-medial approach to reading instruction²

² Owing to a variety of circumstances, a full report of this work has only appeared in Russian. It appears in **A socio-historical approach to learning and instruction** (Pedagogika Publishing House) in the article by Peg Griffin, Esteban Diaz, Catherine King, and Michael Cole entitled, "Re-mediating learning difficulties." A more detailed account of the events surrounding and leading up to the work described here can be found in LCHC (1982).

Our work in the cooking clubs described in Chapter 8 left us impressed with how much Archie was capable of learning, despite the difficulty he experienced in reading. Inspired by his abilities as much as his problems, we proposed a fullblown project focused on children labeled learning disabled using a version of our "same task, different setting" strategy.³ In place of a single child labeled learning disabled we decided to study a classroom of children labeled in this manner and to treat the children as a set of unique cases to be studied in depth over the period of at least a year. Each child would be observed in the regular classroom, during special education training by the school's learning disability specialist, on the playground during recess, in the neighborhood after school, and at home. Each child would also be given a battery of standard tests consisting of tasks widely used to make judgments about learning disabilities and undergo extensive cognitive skills training. Those were the plans.

The research got off to an encouraging start. We found two schools with diverse populations of children in terms of their demographic makeup, active programs for children who were identified by the school as poor readers, and a sympathetic remedial learning specialist. We planned to use one school as the locus of the cognitive training interventions and the other for comparison purposes. Beginning with the first school, we made baseline observations of the children in the various settings and administered a standardized test for purposes of identifying the range of profiles that the children presented. We discovered that if we judged by the test scores, the children were a diverse group indeed, including a few who fit classic profiles of LD

³ The group that undertook this work included Ann Brown, Joe Campione, Bud Mehan, and Ken Traupmann. Brown and Campione were engaged at the time in creating new forms of reading activity and designing cognitive training regimes to help low achieving children to overcome their difficulties in school learning. Traupmann shared their interest in cognitive training studies. Mehan was beginning to study the factors associated with the decision to place children in special education classrooms and their fate once placed there.

children, and many who did not.

However, at this point, the teachers began to express discomfort at our presence in their classrooms. We were a nuisance, tolerated but not but not welcomed by busy teachers who could see no immediate payoff for their work in what we were doing. Despite support from the resource room teacher and the principal, teachers wanted to restrict our access to the children in ways that would have rendered the research useless from our perspective. Since we had begun standardized testing at the second school, we decided to move the focus of our work there. Much to our dismay, the teachers again wanted to restrict our access to children.

We had a great deal of sympathy for the teachers' point of view. They were under great pressure to raise the reading scores of their children *now*. A new curriculum mandated by the school district specified precise amounts of time they should be spending on each topic at each part of the day. They might have been more sympathetic if we could assure them that our research would improve the educational performance of the poor readers more than their own efforts, but of course we were in no position to offer such a guarantee.

Faced with this crisis, Peg Griffin and Bud Mehan met with the teachers and the principal as a group to see what could be done. The teachers agreed, reluctantly, to our presence in their classrooms. But they imposed further restrictions that would have thoroughly undermined the purposes of the research.

At this point, the project almost folded. And at this point, the course of my efforts to study culture in mind were set along their current path. Unwilling to give up and unwilling to go on under the constraints that were being imposed on us, we proposed moving the entire operation from the school day to *after school* in order to be able to continue working with the children, but to take the pressure off the teachers. In place of observation of their educational activities during

the school day, we would create our own lessons with our own curriculum content and then contrast behavior in those settings with the others we outlined in our original proposal.

The principal allowed us to use the school library. We invited all of the children who had previously been identified for our study to participate. On December 7, 1981 we opened "Field College" to 24 children, half of whom fit the clinical definition of learning disabled.

The early history of this effort, which continued for another two years, is summarized in a report completed the summer after we began to take responsibility for teaching children to read as a fundamental aspect of our research (LCHC, 1982). In brief, led by Peg Griffin, we created four different curriculum modules, each of which drew upon extant research on reading acquisition.⁴ The children were divided into two groups of 12, they came on Monday and Wednesday or Tuesday and Thursday. Each module was implemented with a group of about 6 children.

One of the first lessons this effort brought home to us was the enormous amount of work that goes into designing and implementing a curriculum. Were it not for Peg Griffin's expertise and tireless efforts, the effort would have proven a fiasco. Instead, each curriculum module produced evidence that the children were learning and each provided us, the researchers, with interesting data.

Perhaps the other major lesson was that in moving reading instruction from the school

⁴ The four models were based upon the following ideas: 1) Increasing comprehension through increasing lexical access based on the work of Isabel Beck and her colleagues at the University of Pittsburgh (Beck, Perfetti, and McKeown, 1981); 2) Enhancing comprehension as internalized problem solving (from the Kamehameha Early Education Project (KEEP, 1981); 3) Comprehension enhancement through the guided anticipation of meaning (Fillmore and Kay, 1981); Reciprocal reading instruction (Brown and Palincsar, 1982).

day to after school, we were moving from an institutional setting backed by legal sanctions to one that was voluntary. The same was true in the case of the afterschool clubs we had conducted at Rockefeller University, but we felt it less there because the club sessions were held only once a week and they had no mandatory pedagogical component-- they were designed to be fun and by and large the children treated them as fun. But how does one make reading instruction fun for a group of children who have been failing to learn to read for 2-4 years in their classrooms, most recently, earlier the same day?

In so far as possible, we tried to make the curriculum models interesting by making them small group activities that kept the children actively involved. We also arranged for the 6 children who were not involved in reading to play computer games. When disciplinary problems arose we dealt with them in a variety of ways. The major strategy was to respond to disruptive behavior indirectly in an attempt to subvert it, creating elaborations of the instructional scripts that appropriated favored child activities (e.g. drawing or crumpling paper into wads to throw. We resorted to direct control only when physical damage was threatened. In such cases, the child was reminded that participation was voluntary, so we would be happy to escort them home. In only one case did we exclude a child from participation because he threatened severe harm to a staff member and himself. On a few other cases, we escorted children home to make good on our promise that participation was voluntary. But by and large, the children preferred to engage with us in the activities than to be at home in the afternoon.

The study I report on in the next section was carried out during the second year of Field College when we had established relatively stable and workable routines. It focused on the diagnosis and remediation of children's reading difficulties using our elaboration of the Brown and Palincsar reciprocal teaching procedure.

Traditional Theories of Reading Acquisition

There is broad agreement that reading is a complex skill that requires the coordination of several related subprocesses and sources of information and a great deal is known about the processes involved for those who have acquired some degree of skill (Crowder and Wagner, 1992). But despite intensive research efforts throughout this century, and especially over the past two decades, the process of acquisition remains disputed (See Adams, 1991, for a juxtaposition of conflicting views). The problem is an important one because at present a great many children of normal intelligence fail to acquire reading skills deemed adequate for productive participation in modern societies (Miller, 1988).

Despite significant differences among them, modern approaches to reading have distinguished two, presumably distinct, major components of the reading process: Decoding (the process by which letters of the alphabet are associated with corresponding acoustic patterns) and comprehension (the process by which meaning is assigned to resulting visual/ acoustic representation). Within this seemingly obvious dichotomy, theorists differ on the question of how to sequence instruction (code emphasis first versus meaning emphasis first) and how best to help children "break the code" (by teaching phonetic analysis or by teaching whole words).

An example of a "code emphasis first" approach can be found in the work of Jean Chall (1983) who proposes the following stage theory of reading development (I concentrate here on the early stages that apply to the children we worked with).

Stage 0: Prereading. Children at this stage may pretend to read and know some letter names

Stage 1: Decoding. The basic task of Stage 1 is to learn the arbitrary set of letter

in the alphabet and to decode their correspondence to the sounds of spoken language.

Stage 2: Confirmation, fluency, ungluing from print. New readers confirm and solidify the gains of the previous stage. To avoid confusion, they are given familiar texts which do not demand much mental effort comprehend.

Stage 3: Reading for learning something new. Instead of relating print to speech, children now are asked to relate print to ideas. It is only at this stage, writes Chall, that "reading begins to compete with other means of knowing."

In the two remaining stages, children elaborate their comprehension skills, learning to juxtapose facts and theories, and to construct complex ideas with the help of print.

Critics of the "decoding-before-comprehension" approach to instruction (Goodman and Goodman (1990) start from the assumption that children living in a literate society arrive at school with the rudiments of reading-as-comprehending-the-world-through-print already in their repertoires; for example, children can read various road signs, pick out the MacDonald's logo, and perhaps recognize their own names in print. Unlike Chall's approach, The Goodmans' model of acquisition is non-developmental in the sense that acquisition does not entail the emergence of any new process or the reorganization of old ones. All children need from the beginning of formal instruction is to expand the repertoire of functions that they can accomplish with the aid of print. This expansion process occurs naturally with the accretion of experiences in comprehending the world through print. Consequently, mastery of the code goes hand in hand with expanding the functions to which reading is put.

A Cultural-mediational model

Like Chall, we believe that reading is a developmental process and that the goal of

reading instruction is to provide means for children to reorganize their interpretive activity using print. Like the Goodmans, we believe that reading text is an elaboration of the pre-existing ability to "read the world" using signs of various kinds.

The approach we developed is distinctive in its simultaneous emphasis on three, inter-related points. First, we believe that reading instruction must emphasize both decoding and comprehension in a single, integrated activity (an assumption that can be interpreted in terms of the idea that reading requires the coordination of "bottom up" (feature--> letter--> word---> phrase-->....) and "top down" (knowledge-based, comprehension-driven processes out of which new schemas emerge (McClelland and Rumelhart, 1981).

Second, we believe that under ordinary circumstances, adults play an essential role in coordinating children's activity such that the development of reading becomes possible. Put differently, reading acquisition is a joint activity, and needs to be treated as such.

Third, we believe that successful adult efforts depend crucially on their organizing a "cultural medium for reading" which has the properties of culture that I have been emphasizing here: it must use artifacts (most notably, but not only, the text), it must orchestrate social relations to coordinate the child with the to-be-acquired system of mediation in an effective way.

As a starting point for our analysis, we begin by modifying slightly the common sense definition of reading. Reading, according to our cultural-psychological perspective, is the process of expanding the ability to mediate one's interactions with the environment by interpreting print. There are two significant aspects of this definition. First, learning to read and proficient reading are both subsumed in the same definition. What one learns to do is expand; what one does, having learned, is to continue expanding (See Engeström, 1987, for a general discussion of "learning by expanding"). Second, there is no dichotomy between decoding and comprehension

since comprehension is understood as the process of mediating one's interactions with the environment, including text processing (interpreting letter groups) as a condition.

With this basic definition in hand, we can now build on the discussion of mediated action described in Chapter 5.

Figure 9.2, which repeats the structure of Figure 5.1,

Figure 9.2

but with Text substituted for artifact, reminds us that reading, in the broadest sense, requires the coordination of information from "two routes." Any reader must "see" the world as refracted through a text; but in order to do so, the reader's more direct access to the world, topicalized by the text, must be simultaneously engaged. As was true in the case of the general discussion of mediation earlier in Chapter 5, the mediational process depicted in Figure 9.1 is a timeless ideal. Even among skilled readers, the act of coordinating the two routes may require adjustments in the representation of the "worlds" arrived at by either route to permit a new representation (expanded understanding) to emerge. The slight discoordination depicted in Figure 9.3 more accurately reflects the dynamic process that we have in mind. Here comprehension is depicted as the emergent outcome of information coming from the "two routes."

Figure 9.3

With this minimal structural apparatus in hand, we can now turn to the crucial question: Assuming that children do not enter school able to expand their ability to comprehend their experience by reading alphabetic text, how can we arrange for them to develop this ability? In

attempting to answer this question, we are simultaneously tackling the crucial question of how it is possible to acquire a more powerful cognitive structure unless, in some sense, it is already present to begin with. This question, called the "paradox of development" by Fodor (1983) and the "learning paradox" by Bereiter (1985), calls into doubt any developmental account of reading that fails to specify the pre-existing constraints that make development possible. Bringing the endpoint "forward" to the beginning is not less relevant in developing the ability to read than in any other developmental process.

Developmental theories of reading such as Chall's are vulnerable to the learning paradox. Since we share with her a belief that the acquisition of reading is a developmental process requiring a qualitative reorganization of behavior (a process we refer to as "re-mediation") we must begin by showing in what sense the endpoint of development, the ability to mediate one's comprehension of the world through print, could be present in embryonic form at the outset of instruction. The solution to this problem is to invoke Vygotsky's (1978) "general genetic law of cultural development": functions that initially appear on the interpsychological plane shared between people can then become intra- psychological functions of the individual. In this case, what we seek is the structural endpoint of mature reading in the interaction between child and adult as a precondition for this new structure of activity to appear as an individual psychological function in the child.

Figure 9.4

Figure 9.4 displays in graphic form the fact that at the beginning of instruction there are two pre-existing mediational systems which can be used as resources for creating the necessary

structural constraints to permit the development of reading in the child. At the far left of the figure we represent the common sense fact that children enter reading instruction with years of experience mediating their interactions through the world via adults. In the center we represent the equally common sense fact that literate adults routinely mediate their interactions through text. Finally, on the far right of the figure is the to-be- developed system of mediation that is our target.

Figure 9.5

Figure 9.5 shows the next stage in the analytic/ instructional strategy: The given and to-be-developed systems of child mediations are juxtaposed and the given adult system is then superimposed, to show reveal the skeletal structure of an "interpsychological" system of mediation that, indirectly, establishes dual system of mediation for the child, which permits the coordination of text- based and prior-world-knowledge-based information of the kind involved in the whole act of reading.

Creating the Activity

The instructional/developmental task is now better specified: We must somehow create a system of interpersonal interaction such that the combined child-adult system at the right of Figure 9.5 can coordinate the child's act of reading before the she can accomplish this activity for herself. Our strategy for accomplishing this goal was a modification of the reciprocal teaching procedure of Palinscar and Brown (1984), in which teacher and student silently read a passage of text and then engage in a dialogue about it. Together they summarize the text, clarify comprehension problems that arise, ask a question about the main idea, and predict the next part

of the text. In part because the children we were dealing with still had difficulty decoding text, and in part because we wanted to make the activity as interesting as possible, we expanded the number of roles and chose texts that we thought would be of interest to the children (see LCHC, 1982 for additional details). In so doing, we both manipulated the division of labor and provided as attractive a goal as possible.

The core of the procedure is a set of roles/division of labor. Each role corresponds to a different hypothetical part of the whole act of reading. The roles were printed on 3"x 5" index cards. Every participant is responsible for fulfilling at least one role in the full activity of Question-Asking- Reading. These cards specify the following roles:

- *The person who asks about words that are hard to say.
- *The person who asks about words that are hard to understand.
- *The person who asks a question about the main idea of the passage
- *The person who picks the person to answer questions asked by others.
- *The person who asks about what is going to happen next.

All participants including the instructor had a copy of the text to read, paper and pencil to jot down words, phrases or notes (in order to answer questions implicit in the roles) and their card to remind them of their role. The steps in the scripted procedure were written on the blackboard where answers were recorded. All these artifacts represent tools to be used by the adults to create a structured medium for the development of reading and by the children to support their participation, even before they know how to read.

In order to move from the script and other artifacts to an appropriate activity, the procedural script was embedded in a complex activity designed to make salient both the short term and long term goals of reading and to provide a means of coordinating around the script. It

is in this embedding process that we make the transition from a focus on the structural model of reading depicted in Figures 9.2- 9.5 to a focus on reading acquisition as a joint activity.

Recognizing the need to create a medium rich in goals that could be resources for organizing the transition from reading as a guided activity to independent, voluntary reading, we saturated the environment with talk and activities about growing-up and the role of reading in a grown-up's life. This entire activity was conducted after school in a global activity structure we called "Field Growing Up College" (it took place in the auditorium of the Field Elementary School). As part of their application to participate in Field College, of which Question-Asking-Reading was a major activity, the children filled out applications that emphasized the relationship between reading and growing up. They got involved with us in discussions about the difference between growing older and growing up as well as how our activities related to their goal of growing up.

As shown in Figure 9.6, Question-Asking-Reading began

Insert Figure 9.6

each session with such "goal talk," discussion about the various reasons that children might have for wanting to learn to read. These included such poorly understood reasons (from the children's point of view) as the need to read in order to obtain an attractive job such as becoming an astronaut, intermediate-level goals such as graduating from Question- Asking-Reading to assist adults with computer-based instruction, to quite proximate goals--the desirability of getting correct answer on the quiz that came at the end of each reading session.

We began with a group discussion of the title or headline of the story to be read that day. following the script outline written in Figure 9.6, which was written on the blackboard, the

role-bearing cards and the first paragraph of the text were passed around. A good deal of discussion usually ensued about who had gotten what roles; "pick the answerer" was an obvious favorite, while the card implicating the main idea was avoided like the plague. Once the role cards were distributed, the text for the day (usually taken from local newspapers with content that related to matters of potential interest to the children) was distributed, one paragraph at a time. The participants (including the instructor and one competent reader, usually a UCSD undergraduate, and the children) then bent over their passages to engage in silent reading.

QAL could be considered a design experiment creating reading with meaning (Brown, 1992). It was designed to be a zone of proximal development working at the level of small groups and it has the property Courtney Cazden (198?) attributes to zones of proximal development, providing for "performance before competence.". Children were not required to do the "whole act of reading" in order to participate in QAL. They were asked to fulfill partial roles which, as an ensemble, constituted many overlapping moments of reading for meaning. The children are allowed to participate in the whole act of reading-as-comprehending where initially the adults and the artifacts bear a large part of the load, but where children come to be fuller participants (e.g. competent readers) over time.

Initially QAL was strange to everyone, even the adult inventors who were inventing it as they went along. But after a few sessions, a microculture had grown up around QAL. Rituals emerged, such as having a snack to begin the session and a period to run around outside while the adults quickly made up the day's quiz. Everyone got to play all of the roles. The adults had no less role playing to do than the kids, dividing their attention between being a member of the group and being the group leader. These and other procedural arrangements constituted our attempt to organize a medium which would repeatedly create moments when the three

mediational triangles depicted in Figure 9.3 would be coordinated to create the conditions for "re"-mediating the children's entering systems of mediation.

The Data

Our evidence for the way in which this procedure worked is derived from several sources: videotaped recordings of the instructional sessions, the children's written work on the quizzes that completed each session, and various test results.

Although we gathered data from the beginning of the first session, the crucial data for our analysis come after several sessions when the children have mastered the overall script so that the group is working as a coordinated structure of interaction.

Our strategy was greatly influenced by Luria's monograph, *The Nature of Human Conflicts* (1932), devoted largely to an experimental procedure designed to reveal "hidden psychological processes," e.g. thoughts and feelings. The basic idea of Luria's procedure, which he called "the combined motor method" was to create a scripted situation where a subject had simultaneously to carry out a motor response (squeeze a bulb) and a verbal response (give the first word that comes to mind) when presented a stimulus word. In the most dramatic form of this procedure, which has subsequently been incorporated in lie-detector systems, Luria interrogated suspected criminals. He began by presenting either simple tones or neutral words until the subject could respond rapidly and smoothly. Then, among the neutral words he was present a word that had special significance in the crime (handkerchief, for example, if a handkerchief was used to gag a victim). He argued that *selective* disruption of the smoothly coordinated baseline system of behavior revealed the subject's special state of knowledge.

In place of a bulb to squeeze and deliberate deception, our concern was with texts, role cards, and the selective disruption of the smoothly running script of Question-asking-reading.

Hence, it was of paramount importance that we create the conditions for a smoothly coordinated joint activity mediated by the roles, special artifacts, and text.

The first few sessions, while the children are learning to perform the scripted activity were anything but smooth. We were assisted by the presence of undergraduates who participated in Field College as "older siblings." The presence of at least two adults, the researcher and the undergraduate, meant that at a minimum two participants were coordinated through the script and engaged in the full act of reading. Eventually the children got the hang of how to participate in Question-Asking-Reading *even if they had severe difficulties reading*, thereby creating the conditions for diagnosing the "hidden psychological processes" that interfered with their reading.

Here I will concentrate on the **in situ** process of coordination and discoordination around the scripted activity as a key source of evidence about individual children's ability to internalize the scripted roles and the points where internalization fails, resulting in selective discoordination of the ongoing activity structure. In this example, two children, both of whom are failing in their reading classes, differentially discoordinate with the publicly available scripted activity, permitting differential diagnosis of their specific difficulties.

In the transcripts that follow, the two boys, Billy and Armandito are starting to read the second paragraph of the day. Katie is their teacher and Larry is an additional competent reader.

Evidence for internalization of the scripted activity is provided by instances in which the children's talk and actions presuppose a next step in the procedure with no overt provocation from the adults. For example:

(1) Katie: OK, lets go on to the second paragraph then.

(2) Billy: How did they find them?

(3) Armandito: The Eskimos.

(4) Katie: I think it was an accident (as she says this, she begins to pass out the role cards, face down).

(5) Billy: (Taking a card from the stack). How come, what kind of accident?

(6) Billy: (Looking at his card). That's the same card again.

In (2) Billy's question is an internalized version of the "what's going to happen next" role in the script that no one specifically stimulated. He takes the card handed to him, asks a relevant question about the text, and comments on the relationship between his role in the previous segment of interaction and its relationship to what he is about to do. Armandito's participation is of a different order. His comment ("The Eskimos" is relevant to the topic at hand, but opaque. He does not take one of the role cards and has to be stimulated by Katie while Billy continues to show evidence of coordination:

(6) Katie: Armandito! (He looks up and takes a card)

(7) Billy: We each get another one (referring to the cards; there are only four participants and Katie has not taken one, so someone will get an extra).

In a number of places in the transcript we see Armandito discoordinating within the activity which the other three participants maintain, permitting him to re-coordinate from time to time. These discoordinations are of several types. The most obvious are such actions as drawing a picture instead of reading, or feigning abandonment of the activity altogether. But repeatedly, Armandito presupposes the scripted activity sufficiently to motivate quite specific analyses of his difficulties. The next example illustrates his aversion to the question about the main idea and provides information (corroborated in many examples) of his core difficulty.

(8) Larry: (He has the card which says to pick the answerer). Armandito. What's the main idea?

(9) Armandito: I want to ask mine. I want to ask what happens next.

(10) Larry: No. I know what you want, but I am asking. I pick the answerer.

(11) Armandito: The main idea is...how these guys live.

Armandito is both accepting the joint task of Question- Asking-Reading ("I want to ask mine") and attempting to avoid the role that is at the heart of his problem (figuring out the main idea) by skipping that part of the scripted sequence. When Armandito accepts his role (11) and attempts to state the main idea, his answer (" The main idea is ...how these guys live") is not only vague, it is about the **previous** paragraph.

Through an accumulation of many such examples over several sessions, we were able to obtain a consistent pattern. This pattern showed that Billy experienced great difficulty in coming "unglued" from the letter-sound correspondences when he attempted to arrive at the main idea. When asked about the main idea, he repeatedly returned to the text and sought a "copy match" in which some word from the question appeared in the text. He then read the relevant sentence aloud, and puzzled over meaning. Armandito's problem was of a quite different order: he continually lost track of the relevant context, importing information from his classroom activities that day or previous reading passages which had no relevance.

The first conclusion that we want to draw from this exercise is that we were in fact successful in creating a structured medium of activity which allowed diagnostically useful information about which part of the structure depicted in Figure 9.5 was deficient in the children with whom we worked. However, we also wanted to establish that the Question-Asking-Reading

procedure is an effective procedure for the acquisition of reading. Both Billy and Armandito did in fact improve their reading abilities and Armandito's general behavior in the classroom changed so markedly that he won an award from the school recognizing his unusual progress. However, such individual change could not be attributed to question asking reading, both because it was part of the larger activity system of Field College and because we had no proper control group.

To remedy these shortcomings, King (1988) replicated the small group reading procedures in a followup experiment that included appropriate control conditions, more stringently quantified pre- and post-test measures, and was conducted as the sole activity in a school prior to the start of regular classes.

In addition to testing the effectiveness of Question- Asking-Reading against a no-treatment control group, King included a group of children who were provided the kind of structured intervention that Scardamalia and Bereiter (1985) call "procedural facilitation" to assess whether the dynamic, dialogic characteristics of Question-Asking-Reading were any more effective than workbook exercises in which children completed each of the tasks corresponding to the role cards individually in written form. The children in this experiment, like those in the original work illustrated in the transcript fragment, were selected from the upper elementary grades owing to their difficulties in learning to read.

King found that both Question-Asking-Reading and her version of the procedural facilitation technique boosted children's reading performance. However, children in the Question-Asking-Reading group retained significantly more material from the training passages than did the students in the Procedural Facilitation group. The students in the Question-Asking-Reading group also spent more total time actively engaged with the task and

demonstrated a greater interest in the content of the readings, indicating an intimate link between the motivational, social- interactional, and cognitive aspects of activity-in-context.

These results, although sketchily presented here owing to space limitations provide support for the approach to reading I have summarized in this chapter. Reading, we can conclude, is an emergent process of meaning making that occurs when information topicalized by the text is synthesized with prior knowledge as part of a general process of mediated interaction with the world. The acquisition of reading also provides an excellent example of the social nature of development.

[Figure 9.7 about here]

As a means of bringing together the different parts of the overall system of activity represented by Question Asking Reading, consider Figure 9.7 which is a reinterpretation of Engeström's expanded model of mediation and activity (Figure 5.3, p. 000). Here the individual triangles in Figure 9.2-9.6, which focused exclusively on an assumed diadic relationship between child and adult is expanded to represent the fact that in Question Acting Reading there were several participants who were part of a larger set of ongoing afterschool activities. By interpreting Question Asking Reading in terms of this expanded, social, representation, we can represent the script and procedurss as embodiments of the social rules and the shifting division of labor enters explicitly into the overall schema. Looking upon the activity in this way reveals many resources for coordination that are only implicit in the individual analyses provided earlier.

Remediation Reconsidered

I believe it is useful to conceive of the overall process of learning to read in developmental

terms-- as a process of re-mediation, mediating the behavior of the group and each individual within it in a qualitatively new way. By emphasizing the *re* in re-mediation also serves to remind us that the child was not a blank slate at the start of instruction. Her behavior was mediated by language and embodied social rules at the start of instruction; the challenge was to develop a new system of mediation adequate to the new demands of literacy. Where this instructional process differs from other developmental approaches to reading acquisition is in its emphasis on the special role of the teacher in arranging the medium that coordinates pre-existing systems of mediation in a single system of joint activity subordinated to the goal of comprehension.

Overall, I judge Question-Asking-Reading to be a successful application of cultural-historical theory to the problem of differential diagnosis and remediation of reading difficulties. The resulting system, when tested against a plausible alternative approach, proved more effective. In one respect, however, it was a failure. Once the research monies that had supported the "basic" aspect of the work ran out, the fact that it actually might work in practice was of no consequence. It stopped existing, except in tiny social ecologies (King and ?, 199?).

However, a different fate awaited the other half of Field College, the half that involved computers. The story of how the computer-mediated activities survived and flowered is the topic of Chapter 10.