EDITORIAL NOTE

It should be evident from the masthead that the Quarterly Newsletter has changed homes, which accounts for the slight delay in getting the current issue to you. The change of venue does not imply a change in our commitment to comparative cognitive research, nor a change in the editorial process. As in the past, we will edit the newsletter jointly. You may submit ideas, articles, or annotated bibliographic entries to either of us at the addresses listed below.

The response to this newsletter has far surpassed our expectations. But for the newsletter to continue as a viable means of communication, we must have input from you. Please send us your suggestions and your substantive contributions to the intellectual enterprise which *is* the newsletter.

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Raven's Matrices as Cultural Artifacts
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The Raven Progressive Matrices tests are considered nonverbal tests of intelligence, which is one reason they have been thought to minimize the problems of cultural bias so common in intelligence testing (Thorndike, 1968; Jensen, 1969). The basis of this claim is the research done on the cultural bias of tests in the forties and fifties by Havighurst and Breese (1947), and Eells et al (1951). MacArthur and Elley (1963) confirmed that the Raven and certain other nonverbal tests were the fairest among a large number of IQ tests when used for comparisons of lower-class and middle-class white students. While admitting that absolute cultural-freeness is impossible, Jensen (1973) has argued that the "cultural loading" of the Raven has been reduced almost to the vanishing point.

However, there is a prior question which needs to be answered concerning the cultural significance of this test: Is the Raven really nonverbal? A number of researchers has argued that the Raven is verbal to some extent. Jensen (1968) has insisted that verbal mediation gives a subject an advantage in solving the matrices and other "nonverbal" problems. And by questioning his African subjects after the Raven was administered to them, Irvine found that they reported using subvocal language to think out the hard problems, either in the vernacular, in English, or a mixture of both. He concluded that such items are subject to cultural effects at a verbal as well as a perceptual level (1968). Neither Jensen nor Irvine investigated the functions of communicative language in solving these matrices. My contention is that the instrumental value of communicative language in dealing with Raven and other "nonverbal" problems is more far-reaching than the testing situation ordinarily shows, and that its role deserves more research attention than it has received in the past.

In order to make the instrumental value of communicative language more observable, I arranged to have subjects work on the Raven matrices in four tape-recorded different situations. In the first situation, the Raven Colored Progressive Matrices were administered to ten first grade children (four black, four white, two Chicano) according to the regular test format. In the second situation, these children were given a follow-up interview immediately after the test had been administered. The third situation was an interview held with the teacher of these first grade subjects. We went over the same matrices with her, discussing how she would try to teach her students to solve them. The last situation was a quasi-tutorial session on the Colored Matrices with my six-year-old son. I shall summarize some of the observations I was able to make on the basis of these studies. (For a more extensive discussion of the research, see Roth, 1978).

On the upper half of each page of the Raven test there is a two dimensional "geometric" or "abstract" matrix with a small piece cut out of it, and in the lower half of the page there are six pieces arrayed in two rows which are the shape of the missing piece in the matrix above.

The child is supposed to choose the piece below which will complete the matrix properly if it is placed in the empty space. The pieces and the empty space are asymetrical, with a "tab" on one end, so that they may be properly imagined to fit into the matrix in only one orientation.

Situation One: Standard Test Administration

The children's spontaneous remarks about the matrices took a variety of forms. Sometimes the children said something before making their choice; sometimes they made their remarks after indicating their choice. Two kinds of remarks typically occurred before they made their choices. One type I call "figurative interpretations" of the matrices as wholes. Upon seeing matrix B-4, one girl said, "Look at that eyeball." A boy first called matrix B-5 a "circle" and then changed his mind, saying, "Um, looks like a race track to me." The other type of initial remark the children made before choosing was to ask the tester what the criterion of correctness was. On AB-12 one girl asked, "Do they have to be the same?" This was the most common question asked about the proper answer, and it usually seemed to mean: Does the piece to be filled-in have to match the figure in the quadrant directly above it?

The children's comments about the matrices were not always spontaneous. In some cases they were provoked by the testers' responses to their original choices. The testers were supposed to ask the children whether they were sure their choices were correct if it seemed that they had not made their choices carefully. When that happened, a child might give an explanation to justify the choice. One kind of justification this question evoked I call an "elimination procedure" because the child explained why some of the pieces were not acceptable rather than stating positively why the choice fit. One boy gave an elimination-type justification for his choice on almost every item. On many of the items, a close reading of the transcripts suggests that the boy was actually using the elimination procedure merely to justify his choice after it was already made, and not as a basic search procedure. He seemed primarily interested in showing how smart he was, but a case can be made that the procedure actually contributed to the accuracy of his problem-solving. By verbally formulating the options and stating why they should be eliminated, he was confirming the correctness of his original choice and giving himself a chance to detect any piece which might actually be better than his first preference. As the matrices got more difficult for him, the elimination procedures appeared to be less an act, and more a search for the real answer, since he was uncertain about the choice.

Situation 2: The Interview

In the interview situation, we found that the children used the same kind of terms to justify their choices that they had made during the regular testing, but they made many more of them, because the communicative situation invited it. To compare the frequency of children's comments in the two different situations, we calculated the number of test items on which each child made a remark which was substantively relevant to the matrices and/or the pieces, and then computed the percentage of items covered on which the children actually made such remarks. During the regular testing the subjects made substantive comments on 12.8% of all items recorded, but during the follow-up interviews, they made substantive comments on 87.1% of the items recorded. This shows that the extent of vocalization about the "nonverbal" problems is largely contingent upon the communicative context, not just on the test materials themselves.

The large difference in frequency of substantive remarks between the two phases raises the question whether there was a corresponding increase in the percentage of matrices the children correctly solved during the interview. We found that there was not, nor was there a significant correlation between the frequency of remarks in either situation and the success rate. On the face of it, this lack of association between frequency of remarks and success rate might seem to undercut the basic hypothesis that communicative language has an instrumental value in solving such nonverbal problems. But such an inference is not warranted, because it does not take into account the fact that the use of language is a skill. Any instrumentality can be used well or poorly, and the difference can depend on developmental factors, on training, or on motivation, as well as situational factors like time and information available, restrictions on freedom, etc. For that reason, the **general hypothesis that communication is instrumental for solving "nonverbal" problems does not imply that communication will assure success**. Instead, it implies that success in solving such problems is at least partially contingent upon circumstances which hinder or enhance the use of communicative language as a means of solving the problems.

While the post-test interviews did not lead the children to correct most of their mistakes, it did influence them to change their minds in some cases. Most of the time, the children blithely explained their original choices, without paying much attention to the details of the matrices. One reason seems to be how we arranged the interview. Our opening question was usually, "Was this one hard or easy?" If the children said it was easy, the testers often moved on to another item without pressing for further information. So the most extensive questioning was likely to be done on those matrices on which the children acknowledged themselves to be uncertain. In cases where the children were led to give more careful explanations, they were more likely to change their answers. We tried to be non-directive in our questioning, but we did encourage them to change their minds if they showed signs of doubt. One girl changed her mind on three successive problems in the B-series, the hardest, but it did

not improve her overall performance because she replaced an incorrect answer with a correct answer on only one item. She replaced a correct answer with an incorrect one on one item and on the third she replaced the one incorrect answer with another. Nevertheless, the process of questioning and justifying was instrumental in her work on these problems because it led her to reconstruct her original choices, identifying the original answer and the original grounds, making it possible to reconsider the validity of the original choice, to formulate new analyses, pose alternatives, and to make new choices.

Although the testers were not supposed to tell the children whether their choices were right or wrong or instruct them directly on the ways of solving the matrices, we saw in reading the transcripts of the questioning that the testers' questions and encouragement actually did affect the children's choices. It seemed reasonable to hypothesize that the children's performance on the matrices would have been improved more if the language they used was organized as part of the instructional give-and-take which we expect between teachers and students working on problems together. In that case, the child's effectiveness in using language to solve the matrices would be enhanced by the assistance of a more competent person. This raised the question whether a teacher would normally use language to teach children this age how to solve these problems.

Situation 3: Teacher Interviews

We interviewed the teacher of the children we tested to find out what methods she would use to teach her students how to solve these matrices. The approach she proposed was one of directive dialogue. She would ask the children to choose an answer for a particular matrix, and then ask them to explain the grounds of their choice. She would then challenge them to see whether any other piece would qualify on those grounds. If they discovered new alternatives, she would encourage them to look for other features of the matrix to use as a point of comparison between the relevant pieces. She would also propose grounds of her own for the children to consider. Her approach definitely relied on the children's ability to explain their interpretations of the matrices and to follow her questions, suggestions, and explanations.

Her explanations were of two broad types which I shall call the literal and the figurative. In the literal case, the teacher referred to visible features of the matrices as things in themselves: lines, dots, circles, squares, corners, and colors, among other things. In the figurative explanations she approached the matrix as though it looked like something else, a shirt with a pocket cut out, intersections of streets, a flag, and so on.

When providing these ''figurative'' explanations, she chose her words to get the children to see the matrices as representations of something they were familiar with. That is especially important because the claim that the Raven is culture-fair or culture-free is often based on the claim that they are nonrepresentational as well as nonverbal. Besides making these problems ''verbal,'' the figurative explanations of the teacher and the children made these matrices representational as well. These representations were based on cultural knowledge which teachers and children expect of each other, at least in school.

The figurative theme of the teacher's explanations involved a distinction between the immediate features of the matrices and a process which might have produced them. She explained that it would help the children to have the organization of the matrices explained in terms of a sequence of operations rather than being described as a fixed arrangement of elements. In this case, her communicative efforts would have served to endow the organization of the matrices with a temporal dimension which the children might not otherwise have appreciated. Her method of doing so was to invoke the children's knowledge of temporal organization in other cultural experiences (running out of paint on your brush, arranging tables in preparation for a very large birthday party).

In distinguishing the teacher's literal and figurative explanations, I do not wish to imply that she would normally keep them apart. Even when she identified the matrices figuratively, she went on to analyze them in literal terms to some extent. She took for granted that the children should be capable of mixing figurative and literal expressions as part of an inquiry into the features of the matrices. Mixing the figurative and the literal was a way of tailoring her explanations to the children's interpretations of the matrices as cultural objects.

Situation 4: A Quasi Tutorial

Because our interview with the teacher was limited to hypothetical teaching, I worked on the Raven with my son. There were actually two sessions on the Raven with my son. The first was not recorded; the second was videotaped with the camera focused on the pages of the Raven booklet, so that the gestures we made close to the matrices could be seen very sharply, but the rest of our body movement could not be seen at all. The reader should keep in mind that the illustrations are taken from the second session, so Michael had already had an opportunity to learn a good deal about doing the matrices from the previous session. This does not undercut the significance of the second session, because I was not trying to establish the child's true IQ or see what the child could do if he used his own terms alone and was confronting the matrices for the first time.

As a communicative context, our work might be thought of as a cross between the Piagetian style of clinical questioning and parental tutoring (Hess and Shipman, 1967; Wood and Middleton, 1975). It most closely resembles the tutorial work carried out by Ludwig Feuerstein, the Israeli psychologist, who has been developing an integrated program of testing and teaching for use

with disadvantaged Israeli children (Feuerstein et al, 1972).

With my help, Michael was able to discuss all the items on the Raven Colored Matrices intelligibly, from the easiest (A-1) to the hardest (B-12) and beyond (up to C-4 on the Standard Raven). His performance on these matrices cannot be scored according to Raven standards, because of my assistance; but he was able to make sense of matrices which would ordinarily be far over his head because our communicative efforts create a "scaffolding" for him to work from. Bruner and his colleagues have already shown the cognitive effect of such a communicative scaffolding in their studies of mothers' assistance to their children in problem-solving (Wood and Middleton, 1975). There are three additional points I wish to make about communication between children and adults as scaffolding for the children's problem-solving. First, it has an emotional or motivational side. Second, it is an accomplishment of the child and the adult together, not something which the adult creates and the child merely incorporates. Third, the "perceptual," the "verbal" and the other bodily work of looking and reporting what there is to see in the matrices and pieces were carried on in a very closely coordinated fashion.

Michael usually talked about the matrices only after he had indicated his choice, just as my first grade subjects usually did. Besides telling me about the pieces and the matrices, his language played an instrumental role in the process as a barometer of his willingness to accept further questioning, his confidence in his choices, and his sense of the obviousness of the answers to my questions. We went through a laborious process, one that made him unhappy, annoyed, even whimpering, and boisterous, assured, and dogged by turns. Normally these qualities of speech are classified as expressive rather than instrumental, but they were instrumental for our performance on the Raven because they influenced my choices and his choices of means and ends: whether to search any more for the correct answer; whether to introduce praise and encouragement; whether to make suggestions or ask questions; when to announce if the answer was right or wrong, and so on. Our expressive talk—his complaints, my praise, etc.—also served as means in a more direct sense, means of influencing each other to one end or another. Michael was sometimes so intimidated by a new variation in the matrices that he would shrink from the task, making it necessary for me to pressure him to go ahead. Only then would he discover that he could make sense of them. In some cases I was unable to convince him to go ahead at all, even though he seemed to have mastered the relevant schemes of analysis, because he was too intimidated to give it a closer look.

Anyone familiar with the analysis of face-to-face interaction realizes how many ways in which the participants' behavior affects each other, even when one is the "leader" and the other the "follower." The initiatives of one are affected by the responses of the other. The best illustration of this two-way process of communication in the construction of our intellectual scaffolding is the development of "the rule of twos."

The "rule of twos" was that any detail found in one quadrant had to appear in two. After coming up with that principle, he would sometimes make mistakes on new matrices, but it is an indication of the constructive role which he played in building the intellectual scaffolding for his work, that my challenges mainly involved reminding him of his own rule. Ultimately he cited my own algorithm from the previous session in explaining his own scheme, so it was he who integrated the two formulations.

It is difficult to show how the work of looking and reporting are integrated in the communicative process of solving these matrices, because the details are so complex. All I can do here is to evoke that coordination with a brief example. On one matrix made up of four wavy lines running left-to-right and four running top-to-bottom, he chose one of the wrong pieces, and in explaining his choice he was tracing a top-to-bottom line in that piece with his finger, when he saw the discrepancy between that line in the piece and the corresponding one in the matrix. He indicated his doubt with suddenly halting speech, and then slid his finger in a continuous motion downward to the line in the piece beneath it, tracing its contour, showing that it fit the matrix. That piece was not really correct, because the left-to-right lines were incorrect, but he was still preoccupied with the top-to-bottom lines, so he picked it anyway. But when I asked him why he changed his mind, he began to explain and traced one of the left-to-right lines in this new piece, and this led him to see the discrepancy with the matrix there. From there, he slid his finger over to the corresponding line in the piece to the left, saying, "This one!" He was finally right. In following this process we see the interdependent timing and the focus of the looking and the reporting involved in solving the matrices in a communicative situation like this.

This observation suggests to me the importance in studies of culture and cognition of exploring the communicative context by incorporating the techniques of contextual analysis developed by Scheflen (1973) and others. These preliminary observations of communication about the Raven in different situations suggest that any further investigation of the cultural and linguistic aspects of the Raven and other "nonverbal" problem-solving should take communicative language into account, even if that means that the conventions of objective testing must be violated to do so.

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The Importance of the Social Situation in Assessing Bilingual Communicative Performance

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Although bilingual education programs exist for a variety of reasons and purposes, most, if not all, bilingual programs share a similar goal — to develop children's oral communication skills in both languages. This means that periodic assessments have to be made of how well the children participating in these programs can communicate in either their first or second language. The most common assessment procedure used is that batteries of standardized tests are given to measure language skills such as dominance, comprehension, production, reading and writing, and speaking abilities in either language.

The validity of these language instruments to assess bilingual oral communication skills is questionable. For example, one problem is that these *language* tests, and the information that they provide (e.g., language dominance), have little direct relevance to *communicative* performance. That is to say, the available tests provide virtually no information about those speaking and listening skills or strategies necessary for successful interpersonal bilingual communication. A second problem is that these standardized instruments usually sample specific language performances (e.g., description of objects) in restrictive contexts (e.g., description of objects to an adult tester) that allow the children very limited modes of response. Children's communicative performances vary in accord with the characteristics of the task and the environment (see, for example, Cazden, 1970), but these tests do not focus on the social context in which the children's skills are assessed as an important determinant of performance (Labov, 1968; Hall, Cole & Reder, 1975).

This paper describes a recent study (Moll, 1978) that suggests the importance of carefully considering the children's social context, and in particular, the participants' understanding of the social relations between themselves and their listeners if we are accurately to assess bilingual communication skills. Implications of the study for the assessment of communication skills and for future research are also discussed.

BILINGUAL REFERENTIAL COMMUNICATION

A dyadic referential communication task (e.g., Krauss and Rotter, 1968), in which one child described a referent and another child tried to select it from a set of two, was used to study speech adjustments of bilingual speakers, both within and across ethno-linguistic groups. The subjects designated as speakers for the experimental task were all members of the same age group (eight to nine years old) and had the same background (Chicano) and bilingual language skills, but the subjects designated as listeners differed in age, culture, and language. Listeners were older or younger than the speaker, were of Hispanic or Anglo backgrounds and were bilingual (Spanish-English) or monolingual in English or Spanish (See Figure 1).

The bilingual children designated as speakers performed competently in a variety of situations (e.g., with the older Anglo listeners and with younger Hispanic Spanish-monolinguals). However, in two specific contexts, (1) with younger Anglo (English-monolingual) listeners and (2) with older Hispanic Spanish-speaking listeners, these otherwise competent communicators performed comparatively poorly. An analysis of the message characteristics revealed that the lower listener accuracy in these two situations was caused by the ambiguity of the speaker messages given by the speakers (see Figure 1). What are some of the similarities and differences across these six different communications situations that could help explain the results?

There were several important similarities. For example, there was no variation in task: the same task materials were used and the same procedures were followed for all of the speaker-listener pairs. There was little or no variation in setting, since classrooms that were familiar to both the speakers and listeners were used. In addition, there was also no variation in the speakers' language competence as it is usually evaluated. All of the speakers were carefully assessed as competent bilinguals.

The results indicate that the variation in performance is *not* language specific. That is, in one case the speakers performed worse in Spanish; in the other case they performed worse in English. Therefore, it seems that the communicative performance was influenced by some interaction of the social features of the situation and the language used.

How can we explain this interaction? Although the experimental design did not lend itself to a rigorous contextual analysis, a *post hoc* comparison of the social relations between the speakers and listeners leads to two possible explanations: one ''cultural'' (regarding younger Anglo listeners) and one ''cultural-linguistic'' (regarding older Hispanic-Spanish-speaking listeners). The first explanation is that the speakers' lack of culture contact and interaction with the younger Anglo listeners, in and outside the classroom, contributed to a low level of familiarity and practice with this particular communication situation, which, in turn, detracted from the overall ability of the speaker to handle the task (c.f., Shatz, 1978).

Let me briefly expand on this explanation. Previous research has suggested that communicative success may be influenced by intercultural familiarity (e.g., D'Anglejan & Tucker, 1973). The speakers in the task were children who lived in the lower socioeconomic Latino barrio surrounding the schools. The population of the schools was the same as that of the community — predominantly Hispanic with a very limited number of Anglos. As a result of this social isolation, the speakers had very little social contact with younger Anglo children. Because of the scarce Anglo population in the communities and the age differences of the children, this assumption seems warranted. In the schools I observed that there was little contact between eight-to-nine year-old Hispanic children and younger Anglo children, simply because there was little reason for them to interact. They were in different grades, and their work and play schedules usually varied giving them limited opportunity or reason to play or work together. Thus, a situation existed where there was, at best, limited sociocultural contact.

A comparison of this socio-cultural and linguistic situation to that of the other two younger groups in the study (Hispanic English-speaking and Hispanic Spanish-speaking) seems to add validity to the assumption. With the Hispanic groups the speakers interact regularly in either language. This occurs, for example, with younger siblings, relatives, or neighbors in a variety of situations.

How does the lack of intercultural familiarity or ''culture-contact'' affect the way messages are formulated? It seems logical that this lack of familiarity and practice places an additional workload on the speaker. Greater familiarity with the information needs of a listener means that the processing of information is more automatic and that less effort is required to complete the task. On the other hand, less familiarity with the situation means that communicating is more conscious and more difficult. It follows that, in this latter situation, more resources are consumed by the processing, which in turn makes successful communication more difficult (Shatz, 1978).

The other explanation involves the older Hispanic Spanish-speaking listeners. This listener group consisted of Spanish-monolingual or Spanish-dominant children. Most were recent arrivals in the United States. All were taking English as a second language, and their instruction was usually the responsibility of the Spanish-speaking aides. Therefore, this particular group was also isolated in school from the children who performed as speakers. However, there is a greater familiarity on the part of the speakers with this group than with the Anglo groups, both younger and older. This is due to the larger number of Spanish-speakers in the community and in the schools. However, because the Hispanic-Spanish listeners communicated exclusively in Spanish and because there were few teachers fluent in Spanish, I observed that the Hispanic-Spanish listeners were often isolated within the classroom, sitting separately from the mainstream English-speakers while receiving instruction from the aides.

Nevertheless, the general assumptions of limited culture-contact and familiarity do not seem appropriate in this case. What is relevant for consideration in this context are the sociolinguistic demands of the situation as perceived by the speakers. Segalowitz (1976), for example, has suggested that moderately skilled bilingual subjects experience communicative difficulties when the sociolinguistic demands of the situation require them to use a speech style perceived as being outside their usual repertoire. I am suggesting that this is what happened in these dyads. This is a phenomenon common to bilingual speakers and is a reasonable interpretation in light of the knowledge of what regularly happens in this context.

IMPLICATIONS FOR ASSESSMENT AND FUTURE RESEARCH.

The information presented above suggests some of the complexities involved in assessing bilingual communicative performance; a bilingual's communicative performance is influenced by, and may vary according to, his or her perceptions of the listener's fluency and ability. Therefore, it is important to be cautious and not rely on a single test or a limited task as a measure of communicative competence.

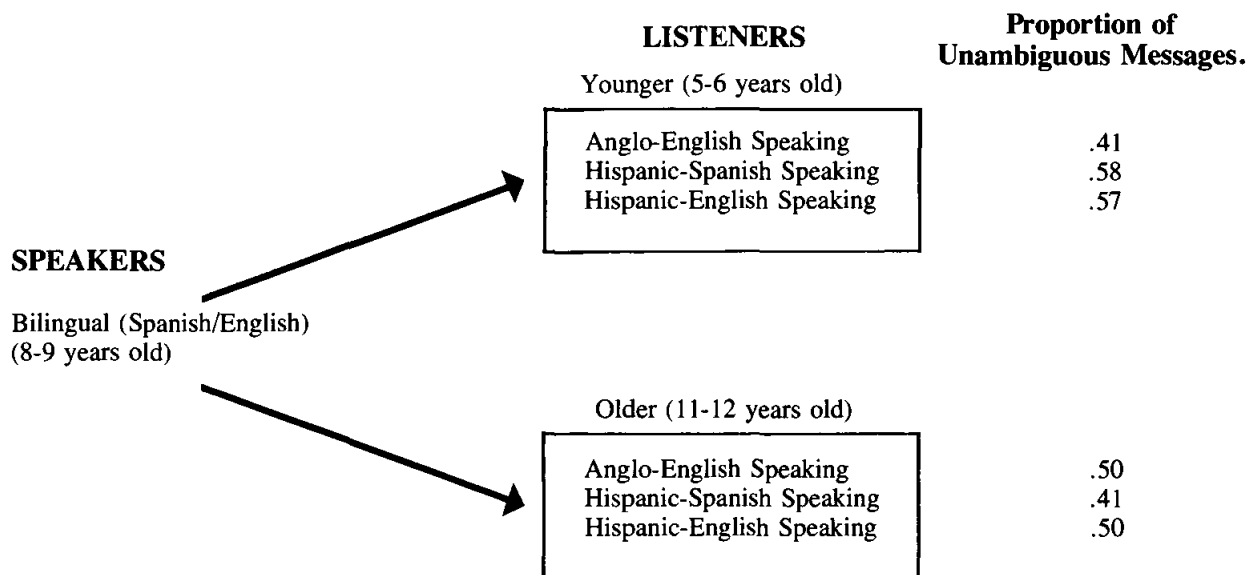It is also becoming increasingly clear that language competence is not the same as communicative compe-

tence (see Glucksberg, Krauss & Weisberg, 1975). Communication involves many extralinguistic factors, such as the different social features described above, that may determine its accuracy or success. This suggests that a valid assessment approach must allow the children to relate their various communication skills differentially to various tasks, situations and contextual demands. Failure to consider the complexity of the social situation or the context in which language is employed could easily lead to erroneous conclusions regarding children's bilingual communicative competence.

It also seems evident that an expansion of the present research approach is necessary. For example, before I would design a similar experiment, I would want information on the regularity or patterns of communication of the speakers with younger Anglos and older Spanish-speakers *outside* of the experimental situation. There is also a need to document the daily routines or life styles of the participants that could indicate how often the groups have social contact and use both languages. Similarly, there is a need for ethnographic observation of the participants' communication in a variety of situations and contexts outside the school. Without this information it is difficult to compare the relationship between experimental and nonexperimental behaviors in any rigorous way. Furthermore, without the information which would result from this comparison, interpretations about the differential impact of the various listener groups on the speaker's communicative behavior would remain speculative.

FIGURE 1.
THE EXPERIMENTAL SITUATION AND THE MEAN NUMBER OF UNAMBIGUOUS MESSAGES BY LISTENER CULTURE/LANGUAGE CATEGORIES AND AGE GROUP.

LISTENERS	Proportion of Unambiguous Messages.
Younger (5-6 years old)	
Anglo-English Speaking	.41
Hispanic-Spanish Speaking	.58
Hispanic-English Speaking	.57
SPEAKERS	
Bilingual (Spanish/English) (8-9 years old)	
Older (11-12 years old)	
Anglo-English Speaking	.50
Hispanic-Spanish Speaking	.41
Hispanic-English Speaking	.50

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Microgenesis as a Tool for Developmental Analysis

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To the vast majority of present-day Western psychologists, the term "developmental" is used almost exclusively as a synonym for "ontogenetic." In fact, ontogenetic analysis has come to play such an important role that we often forget that other types of development can also be of interest. This has not always been the case. For example, many students of developmental psychology will be familiar with the work of Heinz Werner (1948). But unfortunately, this is more history than current affairs. The truth is that we have allowed potentially rich areas of developmental theory and research to lie fallow; or, perhaps more accurately, we have ceded them to areas of research unconcerned with developmental issues and have thereby have deprived ourselves of some potentially fruitful exchanges of ideas.

This constriction of developmental analysis has not occurred in Soviet psychology, and it is instructive to examine the Soviet approach in order to see what could be gained by broadening again the notion of development. Vygotsky and his followers have long argued that developmental analysis is not limited to ontogenetic analysis. For example, they have always stressed the importance of historical development as a theater for the investigation of higher mental functions in humans. For this reason they have addressed such issues as the history of sign systems (e.g., Vygotsky, in press), the history of technology and its influence on human psychological processing (e.g., Tikhomirov, in preparation), and the role of formal educational processes in the transmission of historically developed knowledge (e.g., Luria, 1976). Emphasis on the history of cultural and social systems is so prevalent in Vygotsky's approach that it is known in the Soviet Union (cf. Smirnov, 1975) as the cultural-historical or the socio-historical method.

Our main concern here, however, will be with yet another type of development identified by Vygotsky. This is the development of a skill, concept, or strategy within a single observational or experimental session. Psychological analyses based on this type of development are used today by Soviet investigators such as V. P. Zinchenko (in preparation). Zinchenko has used the term "microgenetic analysis" in connection with this research (Note 1).

Although Vygotsky did not use the term "microgenetic" ("mikrogeneticheskii"), he was one of its early proponents. He developed this notion criticizing traditional experimental paradigms in which subjects are trained "to criterion" before the investigator begins to collect data. Vygotsky argued that by ignoring data which could be collected during the training session (i.e., during the microgenesis of a skill) the psychologist discards some of the important information about the nature of the psychological process under investigation.

> When these data are then discarded or ignored, the research is left with an automatized reaction that has lost its developmental difference from a reflex and has acquired a surface, phenotypical similarity to it. These factors have led to our assertion that previous researchers have studied reactions in psychological experiments only after they have become fossilized (1978, p. 68).

More recently, Zinchenko and his colleagues (Kochurova, Visyagina, Gordeeva, and Zinchenko, in preparation) have used microgenetic analysis to study the composition of eye-hand coordination skills in controlling a lever. Zinchenko typically studies such variables as the accuracy and speed of movements under various conditions. By analyzing how a subject's performance on these variables changes within a single observational period while the subject is learning a new skill, Zinchenko has been able to identify and analyze the origins of that skill. As does Vygotsky, Zinchenko stresses that in order to understand a skill in its final form one must analyze its development. That is, such investigators are not simply interested in microgenesis (or any other form of development) because it allows one to enumerate the stages in the evolution of a skill. By analyzing the processes of skill formation, they argue that we can understand the structure of the final product. Thus, when the microgenesis of a skill varies in certain ways, we can expect the makeup of the end-product to vary also.

In Vygotsky's approach, the key to analyzing microgenesis is to identify functional units in a strategy or skill and examine how these units evolve and interact. That is, one must identify certain aspects of a strategy, each of which can be carried out in a variety of function-

ally equivalent ways, and understand how they develop within a single observational session.

In a recent study (Wertsch et al., 1978) we have examined the microgenesis of functionally defined units of a strategy. Specifically, we examined the performance of mother-child dyads in a task situation where they were to make a puzzle in accordance with a model. In order to carry out this task successfully, the problem-solvers could not rely on self-correcting mechanisms built into the puzzle. Rather, they had to execute the task by using a strategy they imposed on the task materials.

We identified several functionally defined areas of the strategy for carrying out this task, and observed their microgenesis during the problem-solving session. For example, in order to construct one puzzle (the "copy") in accordance with another (the "model"), a problem-solver must: a) know that the model serves as an overall index of the strategy; b) locate the specific place in the model to be replicated at a particular stage of the task; c) choose the appropriate piece based on the decision made in b); d) know that the selected piece goes somewhere in the copy; and e) locate the specific place in the copy where the piece is to go. Of course, this is not an exhaustive list of the functional units in the strategy, but it served as the foundation for our microgenetic analysis.

On the basis of transcripts which were carefully coded for children's eye gaze, mothers' nonverbal deictics, and children's and mothers' handling of task materials, we were able to see how the children carried out each area of the strategy at each point in the problem-solving session. In some cases, they carried it out through social interaction with the mother (i.e., on what Vygotsky (in preparation) called the "interpsychological plane"), and in others, they carried it out independently (on the "intrapsychological plane").

In general, in the dyads involving four-and-one-half-year olds, we observed that the strategy was carried out on the interpsychological plane at the beginning of the task session. As the session went on, the child took over sole responsibility for more and more of the areas until he or she was carrying out the task entirely on the intrapsychological plane. That is, we observed a case where independent functioning in a task (i.e., self-regulation) grew out of the child's functioning through social interaction (i.e., through "other-regulation").

The important point for our purposes here is that we can observe the developmental processes involved by utilizing microgenetic analysis as well as ontogenetic and/or historical analysis. For example, in self-regulation, microgenetic analysis is only one of the developmental frameworks in which we could have expected to witness the transition from interpsychological to intrapsychological functioning.

As psychologists, we must be aware of the various types of development that can be used in psychological explanation and be prepared to be flexible in utilizing any one or a combination of them, depending on the problem under investigation. It is important to note that in some cases there will be complex interrelations among the types of developmental processes. For example, in the study outlined above, some of our younger subjects (three-and-a-half years old) did not make the microgenetic transition from other-regulation to self-regulation, presumably because they were not "cognitively ready" (i.e., because of ontogenetically defined limitations). Thus, a combination of ontogenetic and microgenetic analyses will be necessary to analyze this transition completely.

When it is possible to utilize microgenetic analysis, it has the great advantage of allowing the investigator to observe the genetic roots and the final form of a strategy within a single session. When one observes a subject during all phases of strategy development, one can better identify the transitional processes and limit alternate explanations. In our puzzle-making task, we can see that if the child developed self-regulatory abilities within a single problem-solving session, we are in a much better position to identify the developmental (i.e., microgenetic) foundations and transitions involved than if we were to rely on ontogenetic argumentation. This is because, in ontogenesis, there is often a variety of factors that may have influenced an individual's growth during the time period under consideration, and the investigator will be unable to know which of them influenced the observed ontogenetic changes.

Of course, microgenetic analyses cannot be used to investigate all developmental problems. For example, many studies spawned by Piaget's work have demonstrated that there are limits to how much certain cognitive skills can develop in a single teaching or observation session. One must rely on ontogenetic analysis in such cases. However, sometimes the Piagetian approach can be comparable with that advocated here. Inhelder, Sinclair, and Bovet (1974) report some training studies of the acquisition of concrete operational abilities which have many qualities of microgenetic analyses. At present, the second author is conducting a series of studies that makes use of a microgenetic approach as a tool in elucidating the nature of a "latent" formal operational ability which seems to lie at the transition from concrete to formal thought (Stone and Day, in press; Day and Stone, in preparation).

We are not arguing that microgenetic analysis is the panacea to all our problems in psychological explanation. However, we would argue that it is a valuable, but little used, tool which, if added to our repertoire of research methods, can give us more flexibility in the way we can approach the investigation of psychological phenomena. What is perhaps more important is that if we recognize the potential power of the microgenetic approach and its relation to ontogenesis, we might begin to bring together some disparate threads within current western psychology. Recently Siegel and White (1975) have made a similar suggestion. They have argued forcefully for the revival of the late-nineteenth-century notion of developmental parallelisms, which they have attempted

to capture with the term "Main Sequences." Their argument is that "the progressive organization of a human behavioral adaptation over time and experience has some generally systematic characteristics," and that therefore there will be "formal similarities" between adult (or child) learning and child development. Thus, we can enrich our knowledge of ontogenesis by studying learning (or, in our terms, microgenesis) and our knowledge of learning by an analysis of ontogenesis. The two endeavors are complementary.

It is true that the theoretical foundations of Soviet psychology and Western psychology cannot be equated so easily. The exact nature of the relationship between learning and development is very different in the two approaches. Yet both approaches can benefit from a close coordination between students of microgenesis and ontogenesis.

NOTE

1. It should be noted that the term "microgenesis" more frequently has had slightly different connotations in Western psychology. Werner (1948) actually distinguished between two types of "genetic experiment." The first involved the analysis of "the development of certain processes that have been either naturally or artifically created in the laboratory." The second involves the study of " 'primitivation' appearing in the adult under certain controllable conditions" (Werner, 1948, p. 37). The first of these approaches refers to the gradual course of skill acquisition during an experimental session and corresponds to the usage adopted here; the second refers to studies of the development or unfolding of percepts and concepts over the span of milliseconds. Werner's work and that of his followers was almost totally devoted to the second approach (see Flavell and Draguns, 1957, for a comprehensive review). The first approach has been almost completely neglected, largely because the study of learning has been the province of the behavioristic tradition. ◉

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ANNOTATED BIBLIOGRAPHIES

O'GORMAN, NED. 1978. *The Children are Dying*. Signet. Paperback

In his book, *The Children are Dying*. Ned O'Gorman attempts to demonstrate three major points. The first is

that many of the black children in Harlem are oppressed. He provides numerous examples of abuse - both physical and mental - that is perpetrated against the children.

The second point is that the families of these children are responsible for the oppression. According to O'Gor-

man, the family in Harlem is primarily the mother, since most of the fathers do not enter effectively into the lives of their children. The impact of the "families" on their children is described as overwhelmingly negative. In describing these families, O'Gorman states:

> I think the cycle of poverty becomes almost a physical occurrence in the oppressed peoples. It establishes in the blood a weakness and a tendency to capitulate...I do not speak now of a genetic weakness but of a psychic-imaginative one that captures the essence of the person and sets it off towards the abyss.

Thus, O'Gorman describes these Harlem families as trapped in a cycle from which they cannot escape and which leads to the effective destruction of their children.

O'Gorman emphasizes the need for one to reject the myth that a rotten family or a rotten mother is better than no family or mother at all. He points out how these children are shuffled back and forth from courts to their junky and alcoholic mothers who repeatedly reject them. Thus, he suggests that the state intervene and remove these children from their families. If, according to O'Gorman, they are then placed properly, the children will cease to die.

The idea of the state intervening to save the children from their families is O'Gorman's third major point. He strongly criticizes what he sees as this society's belief in the right of the family over the rights of the child. He views the state as a benevolent system which means well but which is unaware of the dangers of oppression for the child. For example:

> Had the state been alert to the dangers that imprison a child in the darkness of poverty's desperate cycle no child need ever be born to an alcoholic...addicted...malnourished mother.

Or:

> It is the purpose of this book to alert the courts and the people in the social agencies and on the streets so that they might interfere in the brutalization of the children.

Finally, O'Gorman asserts that although the state needs to be responsible for new laws and legislation that will protect the child from the abuse of its parents, he also states that government — city, state or national — is not equipped in either vision or resources to "meet the horror with any hope of ending it."

O'Gorman's major theme can be summarized in the following way: The black child is oppressed. The black family is the oppressor. The state, once alerted, must intervene and save the child by separating him or her from an oppressive family. Only then will the children who are described by O'Gorman cease to die.

O'Gorman has worked with black children in Harlem for more than a decade. He does understand and has sensitively portrayed their plight. Several of these children are students in his center in Harlem where he is working to create a model preschool.

Generally, O'Gorman believes that black children are inherently normal and that if given the proper care they would develop into strong healthy adults. Again, he strongly believes that parents are primarily responsible for their children and that the state should intervene when the family fails to meet its responsibilities.

There is no need and therefore no attempt to argue with O'Gorman about the day-to-day phenomena he describes - the children are definitely dying. However, he does not suggest helpful solutions. His social analyses—like his work— appear to be more person-centered than social-systems centered. Perhaps this accounts for his belief in the benevolence of the state. One possible way to determine the effectiveness of the state as potential guardian is to examine its effectiveness in the lives of children who are already under its care - e.g., in orphanages and other institutions. What are the statistics on the survival of children—black and white— who are already under the control of the state? O'Gorman identifies the forces of evil that devastate these children as a "lack of proper food, rest, psychiatric, spiritual and parental care and the lack of an atmosphere in which the children learn to explore and discover the world". Is he then suggesting that the state is likely to provide these things for the children?

The primary reason for reviewing this book is because of its potential as a source of influence for social policy on the black family. Although O'Gorman does not claim to be presenting empirical data, it is not unusual for data of this kind to be used as a reason for developing new programs for the poor. It is important, no matter how much O'Gorman denies it, that one understands the overwhelmingly larger issues involved in being poor and black in America. The poverty and pathology of O'Gorman's children are not isolated, individual instances. They are part of a larger problem of American society. O'Gorman cannot claim to be just a sensitive observer. He is writing as an educator who is interested in influencing social policy. His descriptions of the lives of these children enable one to feel their plight deeply. However, it is important that he understands the true nature of the pathology and its relation to problems and issues in the larger society.

It is important to comment briefly on one other point made by O'Gorman regarding the right of blacks to censor statements made by whites on the "black situation."

Black professionals' sensitivity concerning the presentation of black life in white-dominated media and the demands of many to censor such presentations has its roots in the stereotyped way that black life in America has often been presented. I believe such stereotypes have been and continue to be damaging to the same black youngsters about whom O'Gorman expresses concern. Such censorship, when it occurs, is a reflection of the black community's concern for its own — exactly the

self-conscious concern which O'Gorman fails to recognize in recommending that the state step in to save oppressed black children.

There is a clear alternative to O'Gorman's recommendation that the state intervene directly with the child. A full employment policy which would provide black parents the resources to care properly for their children, and a decentralized school system beginning at the day-care level which would put resources into the family-neighborhood unit instead of into bureaucratized state agencies would be steps in the right direction.

O'Gorman describes well the consequences of oppression. Now what is needed from him and others are equally potent descriptions of the causes and cures.

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MANDLER, JEAN M., and ROBINSON, CAROL A. 1978
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In recent years a number of researchers interested in the development of cognitive skills and especially the comparative development of different population groups (retarded children, children from other cultures) have made use of differently structured memory tasks as a means of pinpointing theoretically interesting group differences in cognitive processing.

This article by Mandler and Robinson suggests that application of one pair of such tasks, recall and recognition of pictured objects, carries with it difficulties as well as promise. Their research extends comparative studies of the way children at different ages recall and recognize pictures into the domain of pictures of relatively complex, real world scenes. In making this extension, Mandler and Robinson make clear the dangers of restricting comparisons to a single set of materials and offer a more comprehensive account of the factors involved in recognition and recall.

The prior result which Mandler and Robinson used as a starting point in their discussion of the development of recognition memory was that while recall of simple pictures shows a regular increase with age (and retardate—normal or cultural differences as well), recognition of these pictures from a recognition set consisting of other distinctive pictures does not show the expected group differences. This finding seems to fit nicely with evidence that 1) group differences in memory are most pronounced when the memory task requires deliberate application of strategic behaviors for successful performance, 2) recognition could be described as a single—stage storage and retrieval process, while recall requires two or more stages. This confluence of data and theory

led to the conclusion that simple recognition tasks could be used to sample non-strategic behaviors while recall indexes strategic behaviors.

In the past year or so, this conclusion came to be questioned on the methodological grounds that recognition performance was so close to perfect (a ceiling effect) that the kinds of tasks used would be very insensitive to group differences, even if they were present.

Mandler and Robinson not only confirm the importance of this methodological flaw, but adduce evidence to support their belief that crucial to the presence or absence of group differences in performance on recall or recognition tasks is the extent to which they require new kinds of organizing activity as contrasted with tasks that can be successfully executed using cognitive structures which are "automatically accessed." When complex stimuli of real world scenes were organized in a meaningful way, recognition errors for children and adults indicated that the same kinds of information were being processed. But if the elements of the pictures were randomly arranged, the children made errors indicating that they had taken in different kinds of information. Mandler and Robinson plausibly conclude that for the randomly arranged pictures specialized structuring must be carried out by the subject in order to have an organized representation of the picture available at the time recognition is tested.

This research (which has also been carried out in interesting studies of story recall with analogous results) makes the important point that both stimulus familiarity and response dispositions which subjects bring to a memory task will affect the way they eventually deal with it and consequently, the kinds of inferences we draw about their cognitive abilities.

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Subscription price: $5.00 per year.