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ABSTRACT

In behavioral science research, language has been increasingly seen to reflect the concepts that the child has acquired prior to, and hence independent of, the acquisition of language. Analyses based on this idea are confined largely to words that denote clear perceptual referents. Language, however, contains many terms that have no portrayable referents. If it is to be meaningful, any search for the contribution of language to thinking should be carried out in the realm where language may have unique properties for organizing experience. Some terms which exemplify, but which far from exhaust, this phenomenon, are found in question words referring to cause (i.e. why), manner (i.e. how) and time (i.e. when). Largely because the question word "why" occurs more frequently and earlier than these other terms the discussion which follows is largely confined to the child's mastery of this term. Data for the first part of the discussion was collected during work with Doris Allen, a linguist who had collected bi-monthly data on the linguistic performance of a middle-class child. The remainder of the discussion deals with data gathered as part of a much broader assessment of the cognitive skills in children of three to six years of age. The materials discussed here specifically concerns a set of 44 items designed to tap the child's ability to deal with problem solving questions. (Author/JM)

Mastering the Intangible Through Language*

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For many years, psychological research in the area of language and cognition was guided by the idea that language, in particular the language of labeling, was a key tool in the child's acquisition of concepts.[1,2,3,4] Recently, there has been a dramatic reversal of this view. Influenced strongly by the Piagetian model, researchers have increasingly adopted the idea that language does not determine the formation of concepts. Instead, language is seen to reflect the concepts that the child has acquired prior to, and hence independent of, the acquisition of language.[5,6,7,8,9,10] The current view is captured in the statement by Nelson[11] that "a new approach...is necessary because current and traditional models of concept formation are not designed to solve the problem at issue: How does the child match words to his concepts? They are, rather, designed to answer a different question: How does the child form a concept to fit the word?" The latter conceptualization of the problem has been deemed inadequate because it supposes "that the child learns meaning from his encounters with the language rather than from encounters with the physical and social world" (p.268).

This new formulation has been of value in redressing a long imbalance in the language-thought controversy. In its turn, how-

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ever, it stands in danger of recreating the imbalance, albeit in the opposite direction. Specifically, many current statements are worded so as to suggest that this view is applicable to almost all of language functioning. In this form, it represents a major overextension of an idea which evolved in the context of studying the young child's earliest linguistic performance. During this initial period of language mastery, the child does seem to direct his efforts towards finding the semantic equivalents of relationships he has long since mastered on the pre-verbal, sensori-motor level. As Brown[12] has pointed out, these include relations such as "the nominative (e.g., "That ball"), expressions of recurrence (e.g., "More ball")...expressions of disappearance or nonexistence (e.g., "All gone ball")...the possessive (e.g., "Daddy chair"), two sorts of locative (e.g., "Book table" and "Go store") and the attributive (e.g."Big house") (p.101).

A significant feature of analyses such as these is that they are confined largely to words that denote clear perceptual referents---i.e., to terms that McNeill[13] has described as representing "portrayable correlates". Essential to the notion of a portrayable correlate is the idea that the referent in question can be perceived through the sense of vision, touch, and hearing, with vision playing an almost overwhelmingly dominant role. Given the known proficiency of even the very young child in the visual sphere[14], it seems reasonable to accept the idea that the child's mastery of the portrayable can proceed well, without language, and accordingly, that the language associated with such material merely reflects and does not determine the child's knowledge in this sphere.

Language, however, contains many terms that have no "portrayable correlates". In fact, the presence of such terms-terms which denote intangible, but nonetheless meaningful properties-may be one of the unique characteristics of language. It is this line of reasoning that has led me to feel that one cannot easily dismiss the idea that language may make a major contribution to thought, even to the thought of the young child. However, if it is to be meaningful, any search for the contribution of language to thinking should be carried out not in realm where other modalities do an equal, or even better, job, but in the realm where language may have unique properties for organizing our experiences. Some terms which exemplify, but which far from exhaust, the phenomenon to which I am referring, are found in question words referring to cause (i.e. why), manner (i.e., how) and time (i.e., when). Largely because the question word why occurs more frequently and earlier than these other terms, and also because it has played a major role in the analysis of children's early thinking,[16,17] the discussion which follows will largely be confined to the child's mastery of this term.

My thoughts in this area were stimulated not so much by theoretical considerations as by practical ones. For many years, I have been involved in developing a tutorial program to facilitate learning in poorly functioning, preschool age children[15]. In the main, these are children with low IQ scores who come from what are commonly termed "disadvantaged backgrounds". The children have numerous difficulties in school-based material. What

seems to epitomize their difficulties, in the tutorial dialogue at least, are their responses to questions of why, when, and how do you know? It is not simply that the children fail to display causal reasoning. Such reasonsing would not be expected in children of this age.[16] Rather, it is that such questions frequently lead to an abandonment or disruption of the dialogue, even when the children are as old as 6 years of age. For example, if such a child is asked, "Why does this cup" (a bigger one) "hold more than this one?", he might well reply, "I got that in my house". The confusion and failure in the children stand in marked contrast to the ease and accuracy with which well-functioning children respond to the same material at the same ages.

The role of why, how, and when as critical indicators of the child's ability in cognitively demanding exchanges is, upon reflection, not surprising. Even a most preliminary analysis of such questions indicates that they entail demands which are of a different order or magnitude from other question words such as where, what and who. For example, most where questions posed to a young child are of two types and can be handled by two simple strategies. The first involves pointing to the object named (e.g."Where is your nose?"); the second involves offering a label when a) no object is named (e.g., "where are you going?") or b) the object named is not present (e.g., "where is the ball?"). By contrast, why questions cover a much wider, and more complex, range of possibilities. These include why's of action (e.g., "why did he lie down?"), why's of function (e.g., "why doesn't the pen write?"), why's of justification (e.g., "why do you think"["how did you know"] "he was angry?") and why's of causal relations

(e.g., "why do heavy things sink?") (see N. Isaacs' discussion[17] on the range of why's relevant to the preschool age child).

The complexity of the range of why questions that may be asked is mirrored on the response side in the number of strategies required for appropriate answers. For example, why's of action may require a statement of motivation (e.g., "he lay down because he wanted to rest") or a statement of condition (e.g., "he lay down because his back hurt"), while why's of function may require a statement of attribute (e.g., "the pen doesn't work because the point is broken"). Further, unlike the situation of where or what, nothing cited in the question and nothing present in the context need offer a clue as to what might be an appropriate response. For example, in the question "Why does that cup hold more?" there is no hint as to what feature in the situation should be named in the answer---should it be the color, the texture, the size, the location, or the function of the object? The situation becomes even more difficult when the question is such that no perceptible feature in the situation can serve as an answer (e.g., "why is he packing the valise?"). In these cases, any possible answer (e.g., "he is going on a trip") is often disconnected, in both time and space, from the situation that the child can see at the moment.

Given this complex situation, one wonders how the child ultimately achieves mastery over the term. Having become intrigued with the problem, I began to review the literature which dealt with the acquisition of why. Several investigators[18,19,20] report the appearance of this word by two years, but generally they give

little further information apparently because for some time the word is used in ways that are judged "meaningless" by the adult. Significantly, the very meaninglessness of why reinforces the idea that this word is different from most other words used by the child, for implicit in the concept of meaningless is the idea that the word is being produced without being comprehended. As a result, it stands in opposition to the new theoretical formulation (outlined above), which states that meaning precedes language and does not follow it.

These scattered reports indirectly lent support to the notion that why may occupy a unique position in the child's early learning. However, the reports failed to provide a solid picture of the precise sequence by which this term was mastered. For such an understanding to be achieved, it was necessary to have additional data. Given the fact that the child's earliest uses of why were meaningless, it was clear that any such additional data could not be gained from a formal test situation, since formal testing would only reveal the child's lack of comprehension. Instead, it seemed essential to have a naturalistic situation where the child might spontaneously produce or respond to this question in normal interchange.

At the time that my thoughts on this issue were evolving, I was fortunate to begin working with Doris Allen, a linguist who, for quite different purposes, had collected bi-monthly data on the linguistic performance of a middle-class child, named Dusty.[21] The sessions took place when Dusty was between 18 and 31 months and they averaged about one hour each in duration. In all the sessions, the major participants were Dusty and her adult "playmate",

Dr. Allen.

Given the impetus provided by the issues discussed above, we began to examine the data in order to extract all the interchanges in which this term occurred. This included the child's use of the term and the adult's response, as well as the adult's use of the term and the child's response. This section of the paper will be concerned with some of the findings that our search yielded. A fuller presentation of the results can be obtained elsewhere.[23]

Our analysis indicated that Dusty's production and reception* of why could be categorized into three basic strategies. The key features of each strategy are outlined in Table I. As can be seen

Insert Table I about here

there, in the first strategy, (which took place when Dusty was 18 to 25 months), one might be somewhat hard pressed to consider her reception of why as representative of a true strategy. She was rarely asked such questions by the adult, but when she was (as in "Why is the dolly going to sleep?") almost invariably, she either ignored the why, tentatively touched the object named, or else changed the subject. Ervin Tripp[24] noted similar behavior on the part of young children when why questions are put to them. This behavior contrasted strongly to the near universal and nearly always appropriate answers she gave to what, where, and yes-no questions.

*The term "reception" is used, rather than the more traditional term of comprehension, because the child's responses to why could not be said to indicate understanding on her part.

Although Dusty seemed unable to answer adult-asked why's, she did have a production strategy for this term even when she was only 18 months. (This state of affairs is, of course, the one responsible for the generalization that the production of why precedes its comprehension). Her use of this word was not frequent, but it was consistent. First, it occurred only in response to an adult statement; never as a means of describing or questioning perceived events. In other words, from the beginning, why was tied to the linguistic, and not to the physical world. Second, the preceding adult utterance always contained a negative, such as no or not. Thus, a typical exchange in which it occurred went as follows. The object of play was a toy cat who had "lost" its head. The adult commented, "The cat has a body, but no head". Dusty replied, "Why?" The adult responded "Why? I don't know why? Did someone break it?" Dusty's response was to turn away and go to the toy box.

Dusty's pairing of why and negation does not seem unreasonable in that it is probably based on her observation that adults themselves frequently ask "Why?" when they hear a negative statement (e.g., when someone says, "I don't want to...", a common reply is to ask,"Why?" or "Why not?"). What seems of greater interest than the connection between why and negation is the fact that the child's why's rarely led the adult to offer a response which provided any significant feedback about the meaning of the term---other than the feedback that it had been used inappropriately. Typically, the adult might haltingly say, "I don't know why" or "Why do you think it is?" In fact, of the first 19 why's that Dusty asked, only five received replies which might suggest to her that a meaningful response can be

offered to this question (e.g., once, when told not to put a toy in her mouth, she responded by asking, "Why?" and the adult replied "Cause that would hurt you".

Given the generally frustrating nature of such a situation, one wonders why Dusty, and other children, bother to produce the number of why's that they do. No clear answer is possible, but it seems likely that a central element is the fact that the child's linguistic development at this stage is sufficiently advanced to permit her to recognize the existence of this word when she hears it used by others. But that is all her development allows her, for it is a word lacking a physical referent and therefore it is unavailable for exploration through the child's oft-used sensori-motor repertoire (i.e., she cannot stare at it, pick it up, mouth it, kick it, etc.). Given the success that the child has had with her sensori-motor repertoire, it is likely that she will try its techniques on terms such as why. And, in fact, this characterizes one pattern of Dusty's initial response (e.g., touching the object named when asked a question such as "why is the dolly lying down?"). From the response of the adult, specifically the break in the dialogue, the child soon learns that this approach is inadequate.

This situation contrasts sharply with that confronting the child when she hears unknown words referring to portrayable correlates. For example, if a child is asked to 'touch her nose' she may do nothing because she is unfamiliar with the word nose. In all likelihood, the adult will then point to the intended referent, and child will imitate this action, and also pair the label she has heard with the object she has long known. The child's ability

to rely in this way on her sensori-motor skills (e.g., observation, imitation and association) may be responsible for the common finding that the comprehension of language precedes its production.[13] Meaning can be gleaned by the child through trying one or more of her sensori-motor techniques. Hence understanding is possible for the child without her having to attempt any verbal formulation.

Not only are sensori-motor techniques closed off to the child in connection with comprehending why, but they are also closed off in producing the word in that the child's much used gesture system is rendered useless in this situation. For instance, question words such as what can be represented in many situations by pointing (e.g., "What is this called?") or by a furrowed brow (e.g., "What do you want?"). No comparable gestures exist, however, for a word such as why. Its expression seems dependent upon a verbal system.

This constellation of circumstances-namely, the inability to derive the meaning of why by sensori-motor techniques and the inability to express this term through nonverbal means-leaves the young child in a situation in which her preferred avenues of behavior are closed off. She is forced to derive the meaning through a different process. Specifically, she is led to produce the term before she comprehends it. She must adopt this approach because it is the only way in which she can get sufficient feedback to figure out the meaning of the word. But, as indicated by the adult response to Strategy I, production is insufficient to give the child the information she needs to understand and use the term appropriately. It is probably for this reason that she embarks on a second type of strategy.

In the second strategy which began when Dusty was 26 months, she began to use why not simply as a single word utterance, but com-

bined with strings of words. In addition, even though her questions were still "meaningless", she pursued the exchange, almost as if she were intent upon getting an answer. For example, in one exchange, the adult said, "That's the garage door". Dusty replied "Why the garage door? Why?" The adult answered "Hmm?" and Dusty repeated, "Why the garage door?"

The changes in the production of why were paralleled by changes in the child's response to why's asked by adults. In place of the avoidance that Dusty previously demonstrated when asked why, at this stage she now answered "I don't know". Even though this latter phrase had been in her repertoire since 21 months of age and had been used freely in answer to other WH questions, it was not until she was 26 months that she used it in response to why.

This second strategy in handling why was replaced two months later by a third strategy in which Dusty took the whole of an affirmative, not negative, statement by the adult and repeated it, prefacing it by why. For example, in one exchange, Dusty asked "Where's Bobby?" The adult replied, "He's home reading a book". Dusty responded, "Why he reading a book?" As this example indicates, the words placed after the why were almost always imitations of what the adult had just said. (See Clark[25] for similar strategies in another child when faced with the mastery of new, complex verbal material). Significantly, the child's attention to the whole of the adult sentence is almost a prerequisite if the child is to achieve mastery of this term. Why almost always refers to either predicates or whole sentences. Thus, what, where and who can be meaningfully used when the focus is solely on the nominal phrase (e.g., "where ball?"). By contrast, why with a nominal phrase is usually meaning-

less (e.g., "why ball?"). It takes on meaning only when it goes beyond the single object focused on in the nominal and encompasses an entire event.

Her recognition of the importance of the information contained in the predicate was reflected in another use of why. Dusty now no longer limited why to being a response to a statement by the adult. Instead, she used it to initiate discourse about an observable change in the environment. For example, at one point the adult folded up a piece of paper, placed it in her pocket and Dusty said "Why you put this in your pocket?". Although Dusty's use of why in this manner was not common, it was ultimately much more productive for her. Almost always, the adult interpreted this type of questions as meaningful and comfortably gave a relevant answer.

Although the why's of Strategy III are frequently interpreted as meaningful by the adult listener, it is clear that the child still does not have a full grasp of the term, for she was as likely to ask meaningless why's as to ask meaningful ones. For example, at one point, the adult said, "You're stepping on the wash cloth" and Dusty replied, "Why?".

Strategy III was also marked by changes in Dusty's response to the adult's why questions. In contrast to her earlier avoidance of the term and her later use of "I don't know", Dusty now began to maintain the exchange after the question was posed. For example, one exchange at 29 months went as follows: The adult asked, "Why are you putting the tissue in the closet?" and Dusty answered, "So be cool".

It seems clear that Dusty was beginning to grasp the idea that a feature associated with the event or situation should be cited in

answer to a why question. (e.g., placing of the tissues in the closet will result in a change of state). It seems equally clear, however, that as Piaget[16] has demonstrated, she had no real understanding of the causal or logical relationships that might be involved. For example, at one point, Dusty said (of a blanket), "I can't wash this". The adult asked, "Why not?" and Dusty replied, "In here".

From these examples it is evident that the child's task of understanding why is far from finished. She has still not determined which of several possible attributes may be selected for the answer, nor has she determined how different features relate to different why's. Nevertheless, the child's preliminary acquisition of why represents a major achievement. Over a period of months, she has steadfastly pursued the meaning of this elusive term through a course of hypothesis testing. In essence, the child had to form a concept which ultimately matched the word she was struggling to comprehend. Arguments have been raised against such a concept formation view in early language development on the grounds that its achievement would place "an enormous strain on memory and cognitive processing ability in that the child must hold in memory not only all the instances of word but all of the relevant attributes of these instances, until he has extracted the invariance common to all. Although there are common strategies for solving the problem, their use implies a sophistication in and capacity for the use of problem-solving skills that have never been attributed to the infant."[22 p.100]

Despite the intuitive appeal of this argument, the analysis of the child's behavior presented here suggests that these types

of complex problem-solving strategies are, in fact, the ones that the child did adopt in mastering the word why. What I would further like to suggest is the idea that this type of cognitive activity may be uniquely demanded, and thereby, uniquely fostered by certain aspects of language acquisition. Rarely, in any other situation, does the very young child encounter tasks demanding this type of critical, sustained thinking. In other words, while the cognitive skills employed by the child may be potentially available for use in all situations, I believe that they may rarely be mobilized except to meet the demands of certain kinds of language tasks. This position does not state that the presence of words such as why automatically leads to the possession of particular concepts; rather it states that these words are central in leading the child to use conceptual and problem solving skills which would otherwise remain undeveloped.

From a single case, such as the one presented here, it is not possible to determine whether the sequence described above is characteristic of the learning of why in most children. But there is enough comparability between Dusty's handling of why and those of other children reported in the literature to suggest that the sequence reported here is typical of at least one common pattern by which this word is mastered. Most of the reports, however, including that on Dusty, concern children from middle class backgrounds. We have almost no information on how this type of language task is handled by children of lower class backgrounds.

Some doubts might be aroused by the suggestion that differences could be expected in this area. However, reasons for expecting such differences derive from at least two sources. First, as stated

earlier, my interest in this problem developed largely because of the difficulties that many children of lower class backgrounds experience with words of this type in the teaching setting. It seems likely that difficulties expressed at the preschool period have their origins in the children's experiences with these words at an earlier period. Second, a feature that could easily be overlooked in the analysis of the child's acquisition of why is the role that the adult must play if the child is to gain the information she is seeking. The presence of a responsive adult is not sufficient, since the child must take an active part in initiating and sustaining the various exchanges. But the presence of a more mature speaker is essential if the child is to get the feedback she needs for rejecting inadequate strategies. From a number of sources,[26,27,28] there is evidence to suggest that the nature of the dialogue in middle class and lower class homes may be different in ways that are critical for the mastery of terms such as why. It would seem productive, in the light of the issues discussed above, to collect dialogues between adults and very young children of different backgrounds in order to see the nature of the exchange with regard to terms such as why.

Although such data would be valuable, they are presently not available. Therefore, rather than conjecture as to what the possible findings might be, I would prefer at this point to pursue related, but somewhat different data on the mastery of why; in particular, the development of why that follows the achievements attained by Dusty. For a number of reasons, the data are based upon a different methodology and sampling procedure from that used with Dusty. These differences derive from the fact that by the time Dusty was

31 months, she was beginning to offer responses that had characteristics of what would be appropriate answers to why. This achievement meant that in studying the continuing development of why, there was no reason to rely on the long and cumbersome procedure of recording spontaneous language in naturalistic situations. Instead, because the older child is capable of responding to adult-imposed why's, more traditional formal testing can be carried out on relatively large numbers of children in a short period of time. This testing method does not yield information about the spontaneous why's produced by children past the level achieved by Dusty. (The reports of Isaacs[17] offer a considerable amount of information in that area with reference to the functioning of bright children.) The testing method, however, can yield a great deal of information about children's ability to deal with why's asked of them by others.

The information that will be presented below is part of a much broader assessment of the cognitive skills in children of 3 to 6 years of age. The material to be discussed here specifically concerns a set of 44 items designed to tap the child's ability to deal with problem solving questions. The questions, though largely based on why and how, were not confined to these terms. For example, some problems had to be included in order to present the "data base" necessary before one can pose a reasonable why question. For example, the child might first observe the workings of a balance scale, after which he would be asked "What will happen if I put another paper clip on the scale?" Only after he has made a prediction would he then be asked to justify it through the question "Why" (will it go down?).*

*The children would be asked to justify a prediction, regardless of whether it was correct or not. The example above is only for illustrative purposes.

In general, the 44 items fell into 4 categories. These were:

a) multiple choice- the child had to select which of several would be appropriate, given the conditions stated. (e.g., a paper cup, with the bottom missing, is shown to the child. He is told, "Water won't stay in this cup." An array of 6 objects is presented, including one which is the actual bottom of the cup; one which is a similar piece of material but too small for the cup; one which also involves a comparable piece of material, but it contains holes throughout, etc. The child is asked "Which of these should I use to fix the cup?") These items were included to assess the child's skill on problem solving tasks which required no overt verbalization on his part. There were 4 such problems.

b) predicting an event or reporting the reasons responsible for an observed event (e.g., the child is shown 4 blocks, one stacked upon the other. The examiner points to the blocks at the bottom of the pile and asks "What will happen to the pile of blocks if I take this one away?") There were 16 such items.

c) Rationale for an observation concerning objects or events (e.g., the child is shown a mirror and he is told "We look into mirrors". The examiner then shows the child a piece of clear, reflecting metal and a piece of cardboard. The child is then told "Mirrors are made of shiny material like this and not of cardboard like this." "Why do you think mirrors are made of things like this" [the tester points to the metal] "and not things like this?" [the tester points to the cardboard].) There were 18 such questions.

d) Rationale for inability to achieve a specified action (e.g., the child is shown a completed puzzle. He is then shown one piece which is a duplicate of a piece in the puzzle and is asked "Why can't we fit this piece in the puzzle?") This category was separated from the category above because it was felt that the identification of "inappropriate" attributes demanded in why not questions might be somewhat easier than the identification of "appropriate" attributes demanded in a why question. There were 6 such questions.

Aside from the multiple choice items, the children's responses were scored on two major parameters. The first, shown in Table 2, rated the response on a correct to incorrect scale, with a score of

Insert Table 2 about here

3 for correct and 0 for incorrect. The second, shown in Table 3, used a five point scale to rate the pattern of thinking underlying

Insert Table 3 about here

any incorrect response that was offered.

This aspect of the test, like the full test, was administered to 300 children from 3 to 6 years of age. The results on all the children are too extensive to be reported here. Instead, in line with the issues outlined earlier, the major focus was on a comparison of well-and poorly-functioning children's response to why-based problem solving questions. For this purpose, a subsection of the total sample was studied. Specifically, it included those children in the sample who fit the criterion of well-and poorly-functioning at each chronological age (3, 4, and 5 years).

The history of research in this area is replete with criticisms that any assessment of children along these lines is frequently in-

accurate because the poorly-functioning children are mainly from the lower socio-economic groups while the well-functioning ones are mainly from the middle class groups. Hence, any comparison of the groups implicitly judges lower class children according to a middle class standard. In an effort to avoid the difficulties inherent in such a comparison, all the children involved here were from lower class backgrounds, lived in the same neighborhoods, and attended the same schools. Hence, the comparison is between lower class children who are well-functioning and those who are poorly-functioning. To arrive at the selection of these two groupings, children were selected on the criterion that they be between one and two standard scores above, and below, the mean IQ of their group at each age. The mean IQ of the well-functioning group was 116 and of the poorly-functioning group was 89. The distribution of each group was approximately 35% Puerto Rican, 55% Black and 10% White. This type of subject selection yielded 6 to 10 children in each of the two groups at each age (3,4,5 yrs.).

Initial examination of the data indicated dramatic differences in performance between the groups at each; i.e., the mean scores on the 0 to 3 "correct" scale were 0.9; 1.6; and 1.9 for the well-functioning group at 3,4, and 5 years respectively, and 0.2; 0.4, and 0.9 for the comparable poorly-functioning groups. These findings indicate a not-surprising two year lag[30] in that the performance of the 5 year old poorly-functioning child was equivalent to that of the 3 year old well-functioning one. What is more significant, however, is the fact that the performance of the 3 and 4 year old poorly-functioning children was so low on these tasks that it was not profitable to analyze their data further; it.e, their responses were comparable to those of Dusty when she was in the Stage

I and II of her mastery of why.

In view of these findings, it seemed more productive to begin the analysis by concentrating on the performance of the 5 year olds. (In that age range, there were 8 children in each of the two IQ groups .) As shown in the top line of Table 4, there were marked

Insert Table 4 about here

differences in all the categories between the two groups. On all the items considered together, the well-functioning 5 year old children, on the average, achieved some level of correct response on 68% of the 44 problems while the same age poorly-functioning children achieved such responses on only 30% of the problems. These data indicate that these types of questions resulted in the former group enjoying, for the most part, a success experience, while for the latter group in the same situation, the experience was one of overwhelming failure. This pattern was maintained even on the Rationale questions, where the comparable figures were 63% and 22% respectively.

While the general pattern of the results was not unexpected, the magnitude of the difference had not been anticipated. It was as if the two groups of children were functioning on what effectively were qualitatively different levels. In the light of these findings, it seemed essential to study the outcomes of these different levels of performance in order to gain some insight into when the poorly-functioning child could begin to cope with this type of material. Because a longitudinal follow-up of these children was not possible, it was decided instead to study the counterparts of these children at 7,9, and 11 years of age. The term "counterparts" refers to the selection of children who on the basis of reading performance were either succeeding or failing at the same neighborhood schools that

the 5 year olds would eventually attend. At each of these three age groups, 8 well-functioning and 8 poorly-functioning children were tested on the 44 items described earlier*

The results shown in Table 4, indicate improving performance for all the children as they matured. There was, however, a sustained difference between the two "ability" groupings. As assessed in a 2 (group) x 4 (age) x 4 (type of task) repeated measures analyses of variance, the findings indicated a significant difference for all the main effects--groups ($F=41.36$, df 1/56, $p < .001$) age ($F=16.57$, df 3/56 $p < .001$) and type of problem ($F=32.92$, df 3/168, $p. < .001$). None of the interaction terms were significant, indicating that the patterns of growth in the two groups were not different at the different ages. The most striking feature of the findings is that it is not until the poorly-functioning children are between 9 and 11 years of age that their performance equals that of the 5 year old well-functioning child. This result suggests a developmental lag not of the usual two to three years, but rather a lag extending for a period of five years. What is more, the lag is one that has occurred on tasks which the well-functioning child has mastered in the preschool years.

The data suggest one additional finding that may be of significance. The well-functioning children showed steady progress at each of the ages tested. The poorly-functioning children showed a spurt from 5 to 7 years and then essentially no change until about 10 years of age. It remains to be determined whether these results

*Because of school regulations, it was not possible to obtain IQ measures on these children. Instead, reading performance was used as the criterion. Children who read at, or above, grade level were placed in the well-functioning group and those reading one year or more below grade level were placed in the poorly-functioning group. The actual reading scores at 7,9 and 11 years respectively were 2.5; 5.0 and 7.4 for the former group and 1.1, 2.0, and 2.7 for the latter group.

are characteristic of broader patterns of performance, and in particular, whether they are characteristic of a fairly rigid plateau of functioning in poorly-functioning children in the latency period. If such findings were obtained, they would be of major relevance to the design of curriculum in the early school years.

The analysis of the quality of the errors, shown in Table 5,

Insert Table 5 about here

corroborates and extends the findings reported above. As was implicit in the definition of the various types of errors, their quality varies, with an Invalid Response being considered the highest level and No Response the lowest. These a priori ratings received some validation from the results themselves, in that as performance improves (in terms of number of items correct), the quality of the wrong response is also seen to improve. For example, Invalid Responses account for 30% of the wrong responses of well-functioning children at 5 years, but for 70% of their wrong responses at 11 years. Similarly, the comparable figures for the poorly-functioning children rise from 9 to 42%. Nevertheless, at all ages, the poorly-functioning children have a much higher percentage of their wrong responses in the "poorer" categories. Just as occurred with the total number of items correct, it is not until the poorly-functioning children are between 9 and 11 years that their pattern of wrong responses begins to approximate that of the 5 year olds well-functioning child.

In an effort to evaluate the results more systematically, the wrong responses were grouped into one of two categories-"teachable or unteachable". These categories, which are derived from the clinical experience with the children, refer to the fact that with certain

types of wrong response, it is possible for the teacher to lead the child to overcome his error-hence, these are termed "teachable" errors. On the other hand, certain kinds of wrong responses indicate that the child is so at a loss that it is extremely difficult, if at all possible, to help him understand the problem posed.[15] For example, if when asked the question as to what will happen to the balance scale when a clip is added, the child offers an Invalid Response such as "It will not move", the teacher has open the possibility of saying, "Let's see", followed by a demonstration of the phenomenon. On the other hand, if the child offers an Irrevelant Response such as 'My friend can do it", there is little the teacher can do at that moment to help the child recognize the solution to the problem posed. Although there are exceptions, the categories of Invalid, Associated, and I don't know* are considered "teachable" responses, while Irrelevant and No Response answers are deemed "unteachable". The percentages of each child in each category were converted by an arc sine transformation[31] and the results analyzed in a 2 (group) x 4 (age) repeated measures analysis of variance. The results indicated a significant effect for groups (F=21.91, df 1/53, $p < .001$). There was no effect for age, nor was there any significant interaction. These results indicate that across all ages, poorly-functioning children gave a much greater percentage of "unteachable" responses and until 11 years of age, the proportion was close to half of all their errors. Thus, not only did the poorly-functioning child fail significantly more problems than the well-

*It may seem surprising to separate "I don't know" responses from "No response". Clinically, however, they are different behaviors. As Dusty's responses indicated, she gave "No response" when her understanding of the question why was minimal. As her knowledge and confidence grew, however, even though her mastery was far from complete, she began to offer "I don't know" responses-and these responses served as a signal that she was willing to maintain the dialogue.

functioning one, but when he failed he was much more likely to offer a response which would be difficult for the teacher to cope with.

The picture conveyed by these data support the clinical observations that led to this research; namely, that the mastery of a term such as why is a long and difficult process for the child and that an initial delay in its early acquisition is associated with an unexpectedly long period of retardation in its ultimate mastery. As a result, poor performance in this sphere in the preschool years is almost a diagnostic sign that the child will experience difficulty in the academic setting.

But the picture is far from simple. As the data indicate, the poorly-functioning children's difficulties were not confined to why questions. They also performed less effectively on the multiple-choice items which did not seem to require any knowledge of why and which did not even require any overt verbalization on the part of the children. This type of result brings us back to the ever present chicken-egg dilemna in conceptualizing the relationship between thought and language. Since the children's difficulties were not confined to why questions, but occurred in all the problem solving items, it could well be argued that their lack was not in the understanding of why, but rather in the averbal conceptual thought processes necessary if one were to deal effectively with the problems posed.

This line of reasoning, however, overlooks an important fact; that is, the problems all concerned concrete, sensori-motor based events--events which are part of the everyday experience of all human beings. And indeed, all the children regardless of whether they were well-functioning or poorly-functioning coped more then adequately when they had to respond directly to such events: (e.g.,-

reaching to catch an object in anticipation that it might fall). It seems likely that regular encounters with the physical and social world are sufficient to lead to this level of adaptation, even in the absence of language. But, the questions did not require this type of immediate, physical appropriate response. Rather they required the child to reflect upon his world and consider hypothetical, albeit potentially real, events. As a result, the child could not act upon the objects; rather he had to accept the imposed problem and call upon skills whereby he could isolate attributes, reject inappropriate possiblities, discount salient but irrelevant features and be attentive to subtle words in the statement of the problem. Many of the skills are similar, and even identical, to the skills that Dusty had to employ in seeking the meaning of <u>why</u>. I would therefore like to propose that the development of these conceptual skills flows not from encounters with the physical world, but rather from encounters with certain forms of complex dialogue. If children have not had the opportunity or need to engage in such dialogue (i.e. the dialogue necessary for the mastery of <u>why</u>, and for the mastery of the many other words referring to intangible phenomena), then it follows that a wide range of their problem solving skills will be adversely affected. In this view, failure to readily master certain types of language does lead to difficulties in conceptualization, but the difficulties do not bear a simple one-to-one correspondence between the word and the concept. Instead, the difficulties manifest themselves indirectly in those qualities of thinking that are fostered by particular types of linguistic mastery.

It is evident that there are weaknesses in this approach. The limited findings presented here certainly do not provide the broad data-base necessary to make this hypothesis intellectually compelling. Further, it seems unlikely that any single set of data could be strong enough to provide unequivocal evidence in this area. The ultimate fate of this orientation therefore can be determined not by "the critical experiment", but rather by the study of the broad range of phenomena that may be involved in the language-cognition network. In this context, it is clear that the present data represent no more than a beginning attempt to tap into this enormously complex network. Nevertheless, despite these limitations, the data do seem strong enough to indicate that our understanding of the child's search for semantic mastery will not be complete if we limit ourselves to the increasingly prevalent assumption that his non-verbal knowledge is, in all cases, sufficient to explain his cognitive and linguistic achievements.

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Table 1

Highlights in a Child's Initial Development of "Why"

Strategy	Age (in months)	Production	Reception
I	18-25	a) Asked, without apparent meaning, in response to negative statement by adult b) Limited to single word utterance	Ignores the question or attends to item names in question
II	26-27	Continues Strategy I, but a) embeds why in multiple word utterance. b) occasionally asks why to initiate dialogue. c) marked increase in number of why questions asked.	Says "I don't know"
III	28-31	Asks why a) in response to both negative and affirmative statements by adult. b) to initiate discourse about observed events.	a) cites some feature in the environment associated with the objects named in the question. b) "appropriate" and inappropriate responses almost equally likely.

Table 2

Criteria for "Correctness" of Response

Sample Problem: Child is shown a balance scale: he observes paper clips being placed on each side. The examiner holds up another clip and asks "What will happen to the scale if I put another clip in?"

Score	Rating	Criterion
Fully Correct	3	child describes focal result: e.g., "that side" (pointing) "will go down"
Part Correct	2	
a.		child gives correct, but vague or poorly formulated answer: e.g., (points) "down"
b.		child gives technically correct, but not focal, result: e.g., "there'll be three clips on it"
c.		child gives correct answer, but adds detracting irrelevant information: e.g., "It will go down 'cos it's white
Ambiguous	1	it is not possible to determine if answer is correct or incorrect: e.g., "It'll move"
Incorrect	0	child does not offer any correct response: e.g., "It has two cups"

Table 3

Criteria for Incorrect Response

Rating		Criterion
Invalid		Child's response shows an understanding of the question, but the answer is incorrect. e.g., "it will go up"
Association		Child's response indicates no understanding of the question, but it is focused on the material e.g., "the cups are white"
Irrelevant		Child's response shows no understanding of the question nor of the material
	-a-	"Personalizes" the task e.g., "I got one of those at home"
	-b-	Imitation e.g., "It will happen"
	-c-	Denial e.g., "You won't put it on"
Don't know		Child states he cannot answer the problem e.g., "I don't know what'll happen"
No response		Child offers no verbal response to problem e.g., shrugs

Table 4

Mean Correct Scores to Problem Solving Questions

Group

Age	Well-Functioning				Poorly-Functioning			
	M.C.*	Pred.	Rat.	Rat.	M.C.	Pred.	Rat.	Rat.
5	2.4	2.2	1.6	1.7	1.3	1.1	0.7	0.6
7	2.7	2.2	1.8	2.0	2.0	2.0	1.3	1.9
9	2.7	2.5	2.4	2.4	2.1	2.1	1.5	1.7
11	2.8	2.6	2.6	2.5	2.3	2.2	2.1	2.1

*M.C. = Multiple choice

Pred.= Prediction and observation

Rat. = Rationale question (why and why not respectively)

Table 5

Percentage Distributions of the Types of Errors

	Group									
	Well-Functioning					Poorly-Functioning				
Age	*Inv.	Ass.	Irrel.	D.K.	N.R.	Inv.	Ass.	Irrel.	D.K.	N.R.
5	29.7	41.0	12.0	7.6	9.5	8.6	37.8	26.8	3.4	22.1
7	22.0	60.9	5.7	5.4	5.4	14.0	37.8	19.3	0.0	28.8
9	34.5	26.7	9.9	14.6	4.1	19.9	40.2	15.4	0.0	24.1
11	71.4	12.4	9.4	0.0	0.0	41.5	32.2	15.6	7.6	3.1

* Inv.= Invalid

Ass.= Associated

Irrel.=Irrelevant

D.K. = I don't know

N.R.= No response