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11
Understanding Sibling Concepts: A Devlopmental Study of Kin Terms in Zinacantan

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How do children acquire the semantic categories around which their social interaction is organized? What role is played by universal aspects of human development? How is this process influenced by specific cultural factors which vary from society to society? These questions were the focus of our study of the development of kinship terms among the Zinacantecos. We chose the conceptual domain of kinship because of its importance to the Zinacantecos, a Mayan group living in the highlands of southern Mexico. We wanted to avoid the ethnocentric bias inherent in studying conceptual development in a domain that is of importance in the investigator's own culture, but irrelevant to the people being studied.

We chose to study the development of comprehension rather than production or definition of kin terms because of its ontogenetic primacy (e.g. Fraser, Bellugi, and Brown, 1963). In this way, we hoped to maximize the performance of each child, thus approaching the child's underlying competence in the conceptual domain of kinship.

At the time of our data collection there existed four main strands of pertinent theory and research, two from psychology emphasizing universal processes of human development, and two from anthropology emphasizing cultural variation.

PIAGETIAN THEORY AND RESEARCH

Research on kinship concepts from the point of view of universal processes of human development stems from Piaget (1928). He questioned children about their families and about families in general, focusing particularly on the concept of "brother". Piaget sees this concept as requiring the logic of relations. A child who has not yet developed the logic of relations will see himself as having a brother X, but will not realize that he is also X's brother. According to Piaget's theoretical analysis, the child's difficulty in handling the logic of relations is a consequence of egocentrism: the child assumes his own point of view on the situation.

> To understand a relation—that for instance of brother to brother—means thinking of at least two points of view at the same time, those of each of the brothers. Absolute notions like those of "boy," etc., presuppose only one point of view. The judgment "Paul is a boy" remains the same whatever may be the perspective adopted. (Piaget, 1928, pp. 91–92).

In Piaget's work, the development of a logic of relations which can be applied to sibling concepts is assessed through a number of different question sets. Each one reveals decentration, a movement away from egocentrism. Most similar to the questions we used is the set illustrated by the following excerpt from an interview with Raoul (age 4), who has one older brother, Gerald, age 7 (Piaget, 1928, p. 84):

— Raoul, have you any brothers?
— Gerald.
— And has Gerald a brother?
— No, only me has a brother.

Raoul cannot shift from his own point of view to answer the question about Gerald's brother. His answer is therefore an egocentric one. Piaget (1928, p. 103) comments that,

> . . . in the case of his own family it is not enough for him to enter into the point of view of others, he must also look at *himself* from the point of view of others, which is twice as difficult [Italics added by authors.]

Piaget also says that children often show knowledge of reciprocal relations among siblings in another family before being able to answer the question that is so difficult for Raoul. From this one can infer that it would be easier to conceptualize a reciprocal relation between two siblings than between oneself and a sibling. Extrapolating from Piaget, we can formulate three *cumulative* stages in children's comprehension of sibling relations within their own family:

1. *Egocentrism*: Children understand kinship terms from their own perspective.

2. *Reciprocity*: Children's understanding of kinship terms reflects knowledge of the relationships between two of their siblings from both points of view.

3. *Reversibility*: Children's understanding of kin terms reflects knowledge of a relationship from two points of view even when they are part of it; they can now reverse their own perspective on a relationship.

Our study of the development of kinship concepts among the Zinacantecos tests the validity of these stages for a much more complex system of sibling terms existing in a completely different type of cultural milieu.

At the time we began to collect our data, Piaget's findings with Swiss children had been replicated in two other European cultures with the same basic kinship system as Piaget's Swiss sample—Australia (Danziger, 1957) and the United States (Elkind, 1962). Danziger also extended Piaget's developmental description beyond "brother" to other English kin terms like "aunt" and "uncle."

The first data on the development of kinship terms in an entirely different kind of culture were collected in Nigeria by LeVine and Price-Williams (1974) simultaneously with our data collection. Their interviews with Hausa children from 4 to 11 focused on kin relations existing in each child's compound, the Hausa's most salient unit of kin affiliation. Like Danziger, LeVine and Price-Williams did not limit themselves to sibling relations, but their questions were different. Children were asked to list the people in their compound. They were then asked "who is" each person on the list, and, if no kin term was given, "How is he related to you?" Responses to these questions were used as a measure of egocentric use of kin terms.[1] Next, children were asked, for each successive pair of people named, "How is this person related to that one?" Responses to this question were considered an index of other-centered use of kin terms. LeVine and Price-Williams found that ego-centered usage preceded other-centered, thus demonstrating in another way Piaget's process of decentration. Because the Hausa children were asked about each kin relation from only one point of view, however, this study does not yield direct information on the development of reciprocity or reversibility of kinship concepts. That is, a participant in their study would be asked "How is *X* related to *Y*?," but not "How is *Y* related to *X*?" and "How is *X* related to you?" but not "How are you related to *X*?"

Our study has two important points in common with that of LeVine and Price-Williams: (1) It asks children about kin relations in their own households. (2) It tests whether the acquisition of kin terms involves a

decentration process. At the same time our study contrasts with theirs in several respects: (1) It focuses directly on reciprocity and reversibility. (2) Our procedure tests comprehension rather than production of kin terms. Whereas Hausa participants were asked to produce a kinship term ("How is *X* related to *Y*?"), Zinacanteco subjects were given a kinship term and asked to produce a name ("What is the name of *X*'s brother?"). (3) Zinacanteco households are stable and generally limited to the nuclear family. Hence we were able to judge the accuracy with which sibling terms were understood. Hausa compounds, in contrast, have shifting membership and include extended family members, while kin terms are collaterally extended. LeVine and Price-Williams were therefore not able to judge the accuracy with which such sibling terms were used.

MEMORY

The second strand of psychological research indicates that the development of memory is a cognitive universal. Many studies show that the memory of American children increases with age (e.g., Hagen, 1972). Cross-cultural studies have made the same point for cultures as diverse as the Kpelle of Liberia (Cole, Gay, Glick, and Sharp, 1971) and rural Ladinos in Guatemala (Kagan et al., 1973). Cole et al. show, however, that memory development only shows up if the materials to be remembered are relevant to the people being tested. Kinship knowledge fits this criterion.

Because family size varies in Zinacantan and because larger families require the child to remember more relations, we were able to study the role of memory factors in our kinship task.

COMPONENTIAL ANALYSIS

The third strand of theory and research, componential analysis, comes from anthropology. It emphasizes variable cultural factors, in focusing on linguistic sources of variation in kinship terms. Componential analysis is a technique from cognitive anthropology which attempts to reveal the conceptual relations within a semantic domain by analyzing its terminology into dimensional components. Cross-cultural analysis of a given domain like kinship shows that different terminological systems involve different conceptual dimensions. From a psychological point of view, one can then ask whether these conceptual dimensions have psychological reality for the people who speak the language.[2] If so, then

one would expect them to come into play in the development process by which children learn kinship terms. One of the goals of our study was to see whether or not this would be the case.

Our article focuses on sibling terms because, from the point of view of componential analysis, they constitute a particularly interesting subset of Zinacanteco kinship terms. At the outset of our study, two componential analyses of Zinacanteco sibling terms had been worked out by J. Collier (1969). One analysis is presented in Figure 11–1.

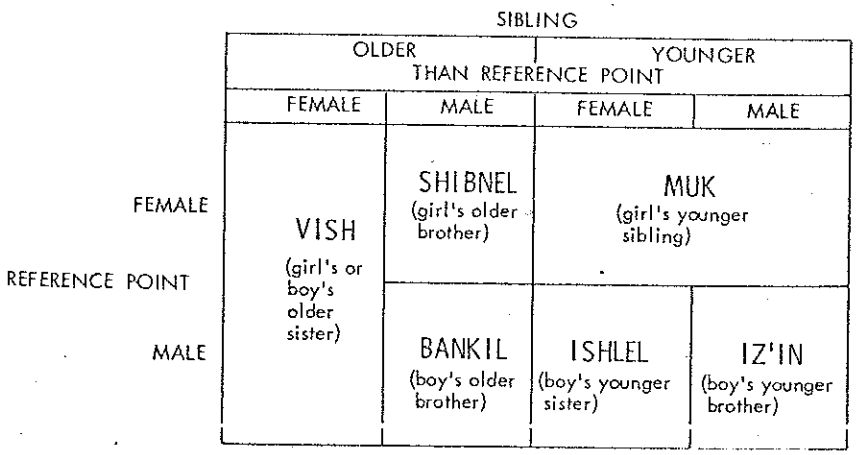

Figure 11–1. Componential analysis of Zinacanteco system of sibling terms of reference

It is based on three dimensions, sex of reference point, sex of sibling, and age of sibling relative to reference point. That is to say, a Zinacanteco speaker would use a different word to describe a sibling depending upon whether the speaker is male or female, and whether the sibling is male or female, and younger or older. Distinctions in two of these semantic components or dimensions are, however, incompletely realized, as Figure 11–1 shows. Sex of reference point is not distinguished in the term for older sister, which is the same for both male and female reference points. Sex of sibling is not distinguished in naming a female's younger sibling; the basic term *muk* applies to younger siblings, both boys and girls. It can, however, be modified to specify sex by the addition of *kreb* (boy) or *zeb* (girl). If these semantic components or dimensions guide the acquisition process, then one might expect the child's comprehension of the terms at different stages to reflect the gradual acquisition of the three semantic components.

A second possible way in which semantic components might be

reflected in the acquisition process would be that componentially more complex terms would be learned before componentially simpler ones. For instance, *bankil* (boy's older brother) and *shibnel* (girl's older brother) are componentially more complex than *vish* (older sister), which does not involve the component, sex of reference point.

The other componential analysis (Collier, 1969) is present in Figure 11–2.

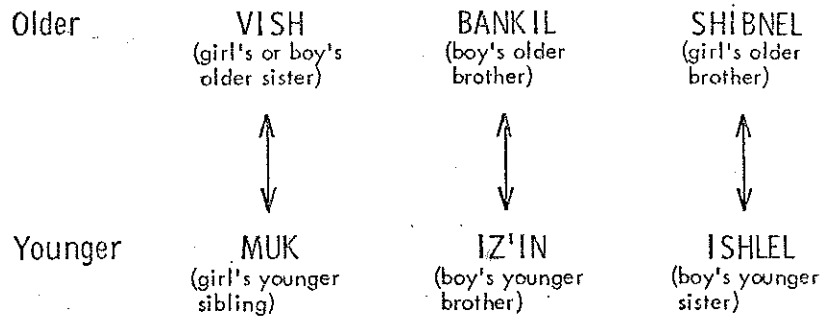

Figure 11–2. Componential analysis of Zinacanteco sibling terms based on two dimensions

This one is based on reciprocity and relative age. The relative age dimension is the same as in the three dimensional analysis of Figure 11–1 but the two sex dimensions have been replaced by a reciprocity component. Two terms, p and q, are in a reciprocal relation to each other, if, where A and B are two people, the proposition *A's p is B* is the inverse *B's q is A*. Here is an example from English sibling terms:

A = Sarah
B = Jeremy
p = brother
q = sister

A's (Sarah's) p (brother) is B (Jeremy) B's (Jeremy's) q (sister) is A (Sarah). Hence "brother" and "sister" are a reciprocal pair of terms.

This model substitutes one relational component, reciprocity, for two

categorical components, sex of ego and sex of sibling. Since all terms now have the same number of components, this model reduces all to the same componential complexity. Hence, our prediction from this model would be that all terms would develop at the same rate. This prediction differs from that derived from the first model.

Another issue in the relation of lexicon to psychological use of terms relates to the status of descriptive terms. We included two descriptive terms: *muk kreb* "girl's younger brother") and *muk zeb* ("girl's younger sister"). Brown and Lenneberg's (1954) codability argument says that shorter terms are more codable and therefore easier to retrieve and use. If a concept can be expressed in a single word, in a particular language it is thought to be more salient in that particular culture than another concept which must be expressed by a phrase. Extending the codability argument to acquisition, one would predict that a compound term like *muk kreb* ("girl's younger brother") would be harder to learn than a simple term like *iz'in* ("boy's younger brother").

On the other hand, we conceived of arguments which would lead to the opposite prediction. *Muk kreb* includes the term *kreb*, "boy," which makes explicit the fact that the referent is a boy. This explicitness about the sex of referent component could make such a term easier to learn and to use. The inclusion of two descriptive terms *muk kreb* ("girl's younger brother") and *muk zeb* ("girl's younger sister") allowed us to study the effect of compound terms on the acquisition of kinship terminology.

After our data were collected, a third type of componential analysis was suggested as a model of children's development of English kin terms by Haviland and Clark (1974). They tested the psychological validity of a system of componential analysis (developed by Bierwisch) for describing the development of children's definitions of English kin terms. Their system makes fairly good predictions about the relative developmental difficulty of different terms (e.g., mother, aunt) and about stages in the acquisition of particular terms. Applying their system to Zinacanteco kin terms, we emerge with the following componential analysis: we first represent *X*'s relationship to *Y*.

vish: [Y child of A & B] (A & B parents of X] [X older than Y] [female X]

Two inverse rules are necessary to derive the reciprocal term:

[W parent of Z] ⇔ [Z child of W]
[U younger than V] ⇔ [V older than U]

Applying these rules, we get Y's relationship to X:

muk: [X child of A & B] [A & B parents of Y] [Y younger than X] [female X]

Other pairs can be similarly defined.

bankil: [Y child of A & B] [A & B parents of X] [X older than Y] [male X] [male Y]

Again, the application of the two inverse rules yields the reciprocal term, *Iz'in* (boy's younger brother).

iz'in: [X child of A & B] [A & B parents of Y] [Y younger than X] [male X] [male Y]

The last pair of Zinacanteco sibling terms *shibnel* ("girl's older brother") and *ishlel* ("boy's younger sister") would look like this:

shibnel: [Y child of A & B] [A & B parents of X] [X older than Y] [male X] [female Y]

Applying the two inverse rules, we get:

ishlel: [X child of A & B] [A & B parents of Y] [Y younger than X] [male X] [female Y]

This analysis combines all the features of the other two into a single system. It also includes relational features indicating that siblings must have common parents. (Although Haviland and Clark put their definitions in terms of a single parent, siblings are actually defined in terms of two parents, and this fact is recognized in our definitions above.) Predictions about the relative complexity of terms would be exactly the same as those derived from the first componential analysis shown in Figure 11–1. That is, the terms *vish* ("girl's or boy's older sister") and *muk* ("girl's younger sibling") would be the least complex; each one has one sex feature while the other terms have two each.

Of particular value for our data analysis was Haviland's and Clark's (1974) realization that componential analyses involve the same conceptual features as Piaget discusses, sex and reciprocity for example. This connection allows us to make developmental predictions not possible from componential analysis alone. Because, according to Piaget (1928) relational concepts are more difficult than categorical (absolute) ones, the two sex components should precede the two relational components,

younger/older and parent/child. If we consider the sibling terms alone, it seems that the parent/child components in Haviland and Clark's (1974) model could be simplified from [A & B parents of Y] [X child of A & B] to [A & B parents of X] [A & B parents of Y]. It would not be necessary to conceive of the parent-child relation as a reciprocal one. The application of the inverse parent-child rule (p. 29) is not necessary to derive reciprocal sibling terms. Thus the number of rules is reduced from two to one. As Haviland and Clark (1974) point out, a one-way relation is easier than a reciprocal one. Therefore, one might expect the parent/child component to develop before the necessarily reciprocal relation older-younger.

We used our data to see whether the development of sibling kin terms reflects the development of semantic components and, if so, which of the three models makes the most accurate predictions about the psychological facts of comprehension.

ETHNOGRAPHIC INFORMATION

The last strand of theory and research, ethnography, comes from anthropology and also emphasizes sources of cultural variation. Knowledge of the culture itself has led to hypotheses about the development of Zinacanteco kin terms lies in the culture itself. Vogt (1969) in his comprehensive ethnography about the Zinacantecos comments on the great importance of the older-younger contrast throughout the Zinacanteco culture. The contrastive terms *bankilal*, the property of being older, and *iz'inal*, the property of being younger, derive from the words for "boy's older brother" and "boy's younger brother," but they can be used to distinguish pairs of hills, crosses, shamans, fireworks, and so forth. Vogt states that the age-ranking principle symbolized by these terms is a way of comparing two things in terms of relative power or status, with the older being the more dominant of the two. If cultural importance is a factor in the development of kinship terminology, then one might predict that the pair *bankil* ("boy's older brother") and *iz'in* ("boy's younger brother") would be acquired earlier. Another possibility is that the terms for older siblings might be more salient and therefore easier to learn. If, as Vogt (1969) suggests, "age is of overriding importance" (p. 230) in the Zinacanteco sibling terms, then this fact might be reflected in the early acquisition of the older-younger semantic component relative to the semantic components of sex. Note that this hypothesis runs counter to the prediction from Piagetian theory, which predicts the opposite order. The actual result will enable us to compare the utility of Piaget's developmental theory with that of ethnographic material for understanding the acquisition of sibling terms by Zinacanteco children.

METHOD

Procedure

Before asking our subjects any question, we elicited family trees from their mothers which gave the names of all the household members and showed the kinship relationships between them. We used these family trees to compose a personal set of questions for each subject. Because we wanted to test comprehension rather than production of kinship terms, we phrased our questions so that they included the kinship terms and required one or more proper names for an answer.

Our questions using Zinacanteco sibling terms were of two types: "ego-centered" and "other-centered". Ego-centered questions concerned the relationship of an individual subject to his siblings. These questions were given in the following form where "p" stands for his kinship terms such as "older brother" and "younger sister":

Tzotzil:	*K'usi*	*sbi*	*la*	*p?*
English (literal):	What	his-name	the–your–p	
English (free):	What is the name of your p?			

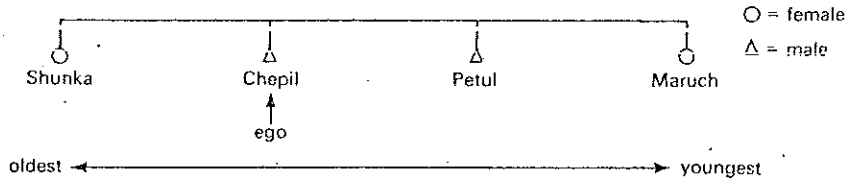

Figure 11–3.

For the sample family tree in Figure 11–3, we would compose three such ego-centered questions for the boy Chepil

1. Q: What is the name of your older sister?
   A: Shunka.
2. Q: What is the name of your younger brother?
   A. Petul
3. Q: What is the name of your younger sister?
   A: Maruch.

Other-centered questions concerned a given sibling's relationship to *his* siblings. They were given in the following form, where "A" stands for a proper name, and "p" and "q" stands for kinship terms:

Tzotzil:	*A*	*la p A,*	*k'usi sbi*	*lis q?*
English (literal):	As for	the-your-p A,	what his-name	the-his-q?
English (free):	As for your p A, what is the name of his q?			

For the same sample family tree we would address seven such other-centered questions to Chepil, using each of his three siblings in turn as the reference point:

1. Q: As for your older sister Shunka, what is the name of her younger brother?
   A: Chepil, Petul.
2. Q: As for your older sister Shunka, what is the name of her younger sister?
   A: Maruch.
3. Q: As for your younger brother Petul, what is the name of his older sister?
   A: Shunka.
4. Q: As for your younger brother Petul, what is the name of his older brother?
   A: Chepil.
5. Q: As for your younger brother Petul, what is the name of his younger sister?
   A: Maruch.
6. Q: As for your younger sister Maruch, what is the name of her older sister?
   A: Shunka.
7. Q: As for your younger sister Maruch, what is the name of her older brother?
   A: Chepil, Petul.

We asked all of the questions in the singular form, even when a complete correct answer included more than one person. (e.g. questions 1 and 7, above) After each response, we asked the subjects:

Tzotzil:	*Mi*	*oy*	*to*	*s p?*
English (literal):	?	there is	still	his-p
English (free):	Does he have any more p's?			

We repeated this question until the subject had told us that there were no more. We also addressed questions to each subject concerning his parents, both ego-centered (e.g. "What is the name of your father?") and other-

centered (e.g. "As for your mother, what is the name of her child?") This paper, however, deals only with sibling terms.

Sample and Analysis

Our data was collected in the Zinacantèco hamlet of Nabencauk in the summers of 1969 and 1970. Our sample consisted of 66 subjects, who can be classified on three dimensions: age, sex, and schooling.

Table 11–1
Distribution of participants and questions by age, sex, and schooling*

	4–5 YEARS		*8–10 YEARS*		*13–18 YEARS*	
	Girls	*Boys*	*Girls*	*Boys*	*Girls*	*Boys*
unschooled	7 (66)	6 (51)	12 (141)	7 (82)	8 (97)	5 (48)
schooled	—	—	5 (55)	9 (120)	1 (7)	6 (76)

*The total number of questions asked each group is given in parentheses.

There were no schooled children in the youngest age group because children in Nabencauk do not go to school until age 6. The virtual absence of a group of schooled girls in the 13- to 18-year-old age group is explained by the fact that Zinacantecos had only recently began to send their girls to school.

Because each participant had a set of questions based on his or her place in a specific family configuration, very few received exactly the same set of questions. For this reason, our unit of analysis is the question rather than the person. Although not all participants would of course have been asked to answer the same number of a particular type of questions, this strategy of analysis allows us to consider homogeneous groups of questions a necessary requirement if we are to draw conclusions about the acquisition process. While the question seemed the most logical unit of analysis, it prevented us from using inferential statistics because of the unequal contributions of each participant to the data pool. Our data analysis has therefore relied entirely on descriptive statistics, and we have been very conservative in presenting only the most clearcut and consistent results.

Another analytic problem was the fact that a given question would vary in the number of required answers depending on the family configuration and size. Take the question, "What is the name of your younger sister?": the required answer would vary depending upon how many younger sisters the participant had. Variation in the number of required answers—that is,

the size of the answer category—was thought to affect the participants' ability to answer in itself, and this needed to be taken account of in the analysis. Because the most frequent size of the answer category was one, we based most of our analysis on these questions alone, thus holding the size of answer categories constant and minimizing the effect of memory skills. Unless otherwise noted in the "findings" section, results are based entirely on questions having an answer category of one. In separate analyses, we looked at the effects of category size per se on the ability to answer kinship questions.

FINDINGS

Decentration

A basic (and also obvious) finding is that the ability to demonstrate comprehension of sibling kin terms in our interview situation increases with age. This is shown by the graph in Figure 11–4. Whereas the 4- and 5-year-olds answer 47% of the questions correctly, the 13- through 18-year-olds correctly answered 94% of them.

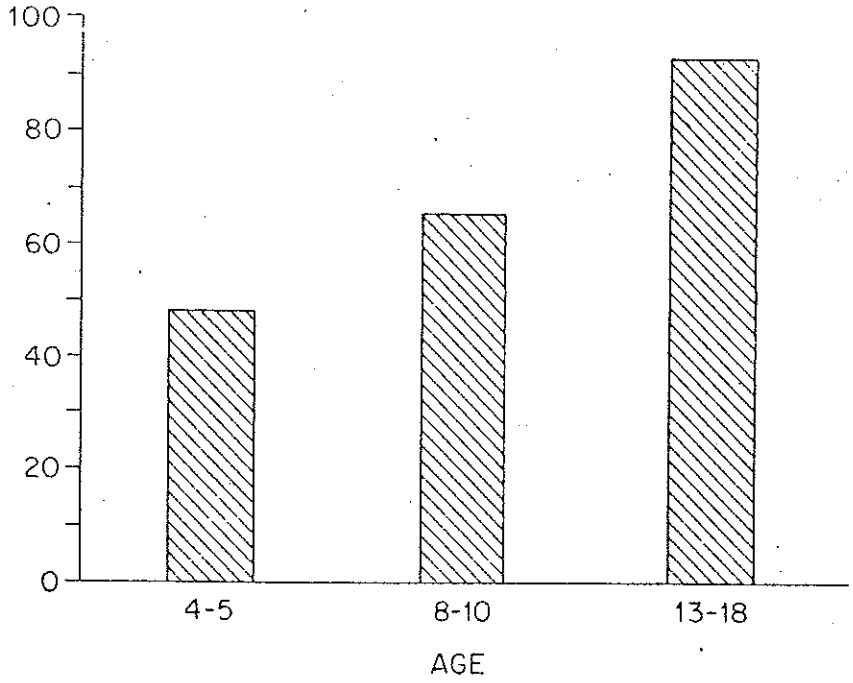

Figure 11–4. Percentage of questions answered correctly at different ages

We found no differences between boys and girls in the development of sibling terms, and so have combined sexes in all analyses. The absence of a sex difference would seem to indicate that kinship is of equal importance to males and females in Zinacantan.

Figure 11–4 also combines data for schooled and unschooled participants, as they did not differ from each other. Since Zinacantecos do not learn about kinship in the Spanish-language Mexican schools, we would not have expected school to make a difference on that basis. It was possible, however, that the *form* of our questions or the questioning situation itself involved skills foreign to the Zinacanteco culture, but native to the culture of the school. The absence of a schooling effect indicates that this was not the case and that we were successful in our attempt to tap a culturally-relevant domain of knowledge. Because of the general absence of schooling effects, we combined data from schooled and unschooled participants in the findings to be presented below.

A difference between the schooled and unschooled participants appeared in only one subset of questions, to be noted, where the unschooled subjects do better.

If we divide the questions into two types, ego-centered and other-centered, we can see that a decentration process is one of the factors involved in this developmental change. Recall that ego-centered questions are of the form "What is the name of your older brother?": they ask about a relation relative to the child. In other words, an ego-centered question takes the child's perspective. Other-centered questions, in contrast, are of the form "As for your younger brother *X*, what is the name of his older brother?" An other-centered question does not take the child who is being questioned as its reference point; it takes the perspective of someone external to the child. Consequently, a correct answer to an other-centered question demands, in principle, relatively greater cognitive decentering than a correct answer to an ego-centered question. Figure 11–5 shows how skill in answering ego-centered questions develops before skill in answering other-centered questions. We can also see that, at every age level, other-centered questions are more difficult than ego-centered questions, although the gap becomes extremely narrow for the oldest age group.

These graphs provide strong evidence of decentration as a component in the development of kin terms.

Other-centered questions are in fact of two types, one in which the answer is the name of a sibling and one in which the answer is the name of the child being questioned. The latter type demands a reversal of the child's own perspective. It is functionally similar to Piaget's question to Raoul. "Has Gerald a brother?" in that a correct response requires a recognition of self as someone else's sibling. For the 4- and 5-year-olds particularly, this

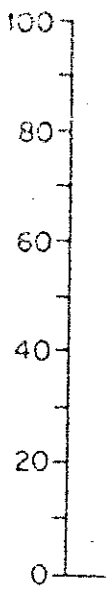

Figure 1

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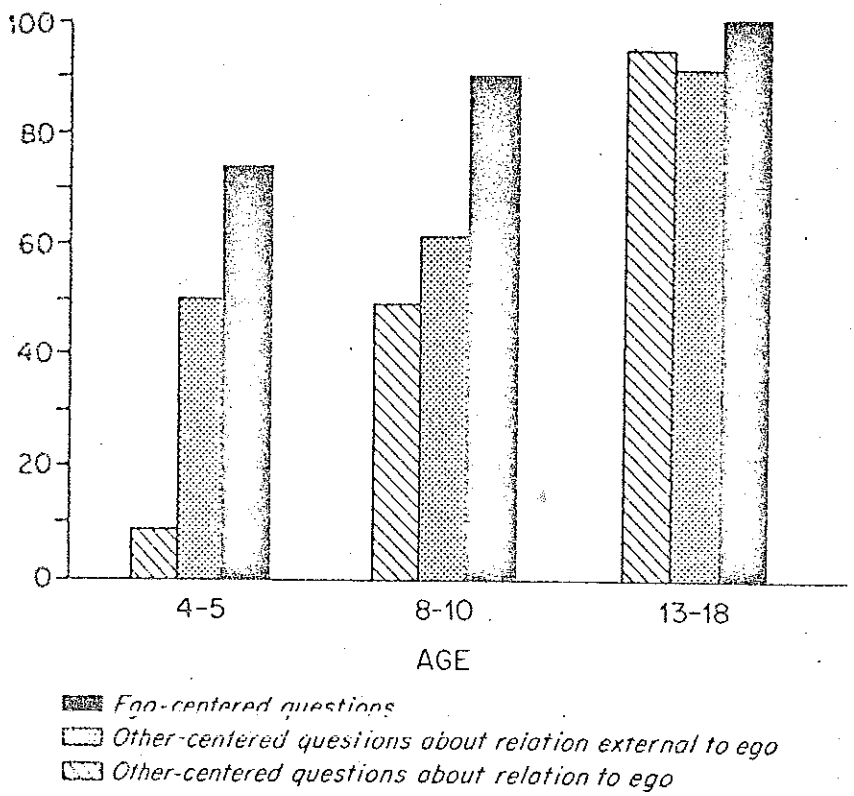

Figure 11–5. Percentage of different types of question answered correctly at different ages

is the hardest type of question, as Figure 11–5 shows.[3] Among the youngest children we have a situation where the child can name, for example, her older brother (see Figure 11–5, ego-centered questions), but cannot name herself as her older brother's younger sister (see Figure 11–5, other-centered questions about relation to ego). One might think that the child lacks the ability to comprehend reciprocal relations, but this is not the case. We must turn to the other-centered questions whose answers require the name of a sibling. Figure 11–5 shows that, while the ability to answer these questions increases with age, even the younger children are able to answer a considerable number. These also are composed of a set of reciprocal pairs: e.g., to a boy, "As for your older sister X, what is the name of her older brother?" Answer: "Y." "As for your older brother Y, what is the name of his younger sister?" Answer: "X." Each reciprocal pair of questions involves comprehending a reciprocal pair of sibling terms, as shown in

Figure 11–2. For instance, the example just given involves the pair *shibnel* ("girl's older brother") and *ishlel* ("boy's younger sister").

Now let us examine the other-centered questions about sibling relations external to the child pair by pair. For the child who does not yet have the concept of reciprocity, the reciprocal relation between a pair of siblings might make it harder to answer both questions concerning such a pair correctly. For the child who does have this concept and who can derive one relation from its reciprocal by applying the inverse rule, a reciprocal relation between siblings should make it easier to answer both questions. Table 11–2 shows the results of an analysis of responses to pairs of reciprocal questions. (Only those pairs where *both* questions had but a single answer could be included in this analysis.) The table compares the actual rates for answering pairs of reciprocal questions, with the expected rates assuming that each question is answered independently.

If children were learning about relations independently, as a series of specific one-way relationships, the actual distribution of rates should be the same as the expected one. If the absence of the concept of reciprocity were making the question pairs more difficult, there should be a heavier-than-

Table 11–2
Expected and actual rates for answering pairs of reciprocal questions about sibling relations external to self

	AGE 4–5		*Age 8–10*		*Age 13–18*	
	expected	*actual*	*expected*	*actual*	*expected*	*actual*
Neither member of question pair correctly answered	25%	37.5%	1%	0%	0%	0%
One member of question pair correctly answered	50%	25%	20%	22%	0%	0%
Both members of question pair correctly answered	25%	37.5%	79%	78%	100%	100%
Total number of question pairs		8		9		11

Note: The expected rates were generated by calculating binomial distributions based on the overall rate of correct answers in each group. The 13- 18-year-olds are, of course, the limiting case of a 100% rate of correct answers.

expected concentration of answers in the category "One member of question pair correctly answered", and a lighter-than-expected concentration in the category "Both members of question pair correctly answered". This is never the case. The only noticeable difference between expected and actual distributions occurs in the youngest group, where the actual rate of answering only one member of a question pair correctly is less than the expected rate, thus demonstrating that the existence of reciprocal pairs of relations among the other-centered questions is not an interfering factor for the youngest children.

The middle age-group correctly answers most pairs of reciprocally related questions, and the distribution of their answers is exactly what you would expect if each question were being answered independently. If these children were using an inverse rule (see Haviland's and Clark's model) to derive a relation from its reciprocal, one would predict the actual rate of correctly answering both members of a question pair to be greater than the expected rate, and the actual rate of correctly answering only one member of a question pair to be less than the expected rate, since the knowledge of either relation in a pair would be sufficient to derive the other one. But inspection of the data from the 8- to 10-year-old group shows that this is not the case. The children seem to be learning reciprocal pairs of relations by treating each member of a question pair as an independent one-way relation rather than as part of a reciprocal relation.

Our results thus far confirm Piaget's view of the process of development. If we take 60% correct as our criterion for having a given skill, we emerge with the following developmental sequence:

Age 4–5: Egocentrism.
Can answer ego-centered questions
Age 8–10: Reciprocity.
Can answer other-centered questions about sibling relations external to self, including reciprocal pairs.
Age 13–18: Reversibility.
Can answer other-centered questions about relations involving ego.

Thus, we have found exactly the same sequence of stages which we extrapolated from Piaget's description of his findings with Swiss children answering questions about brothers and sisters.

Memory

Another non-culture-specific developmental factor is quantitative

memory. To demonstrate the influence of this factor, we can compare responses to questions for which there is but a single correct answer (the body of data under discussion up to this point) with responses to questions for which a correct answer involves naming more than one person. If memory is a factor, then the more members of the category to be recalled, the greater the probability of recalling at least one member. Figure 11–6 shows that this is the case for every age group except the oldest, for whom there is a ceiling effect. At the same time, comparison of the graph lines shows the progressive development of memory with age. More specifically, the youngest children are as likely to produce at least one correct answer as the older children for kin categories containing three or more members in a household, but not for the smaller categories (one or two members). For *those* categories, the probability of producing at least one correct answer increases with increasing age.

Another memory skill that is called for when there is more than one sibling in an answer category is the ability to make a list. Lists require not

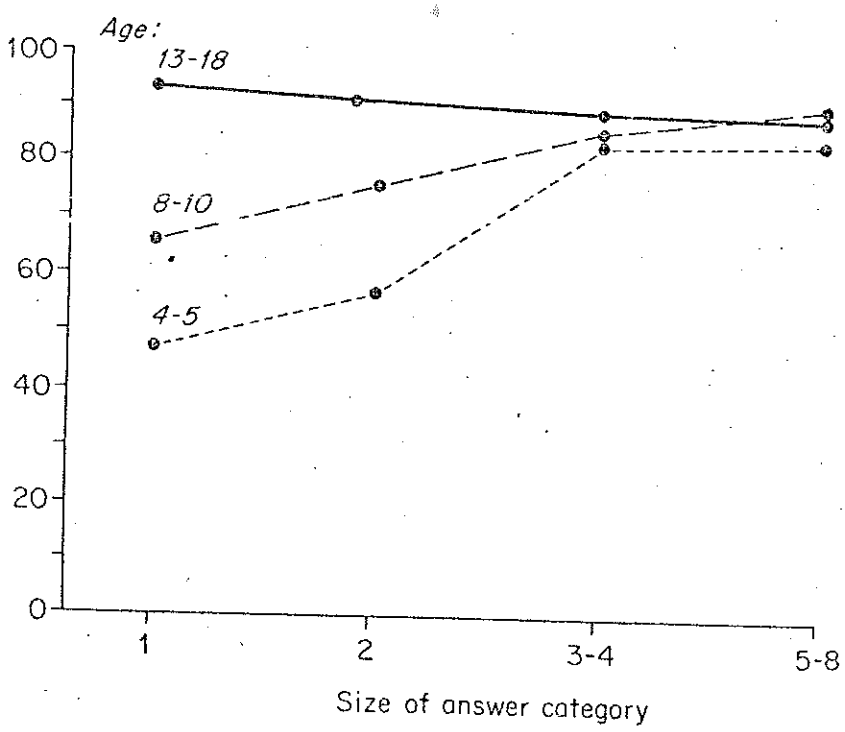

Figure 11–6. Percentage of questions eliciting at least one correct answer as a function of category for children of different ages

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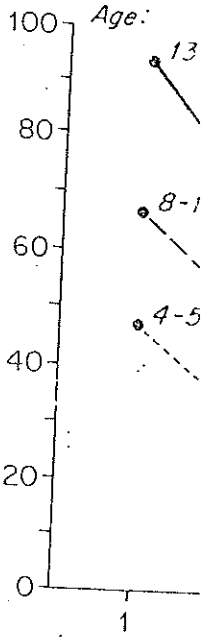

Figure 11–7. Percer
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Componential Analys

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only retrieval of data but ordered retrieval so that one can remember which items have already been retrieved and which have not. The larger the answer category, the longer the list, and the more difficult it should be to retrieve the complete list. Figure 11–7 shows that this is indeed the case. This figure also shows that, in general, the ability to construct lists of any given size becomes progressively greater as age increases. The only deviations from these patterns are due to a floor effect for the youngest children such that they are not able to generate any complete lists for categories containing three or more members.

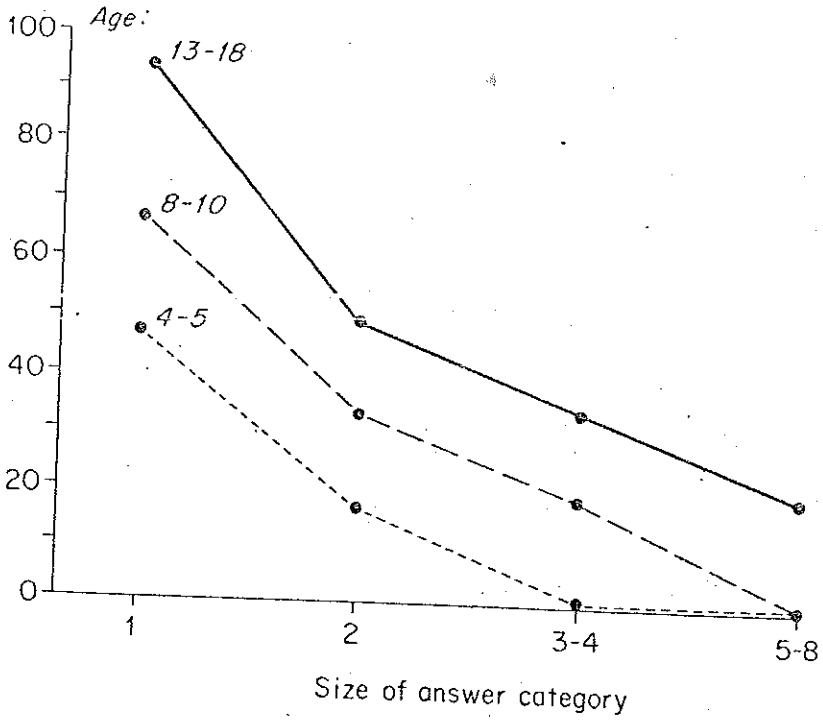

Figure 11–7. Percentage of questions completely answered by children of different ages as a function of category size

Componential Analysis and Ethnographic Information

Basically the structure of the terminological system had no effect on the level of performance in our task. Questions involving all seven terms, including the two descriptive terms, were of equal difficulty. (In comparing responses to different terms we have pooled from all age groups for questions receiving single answers in order to have sufficient observations

for each term.) Hence, componential complexity did not relate in any way to psychological complexity. Nor were descriptive terms more or less difficult than basic terms. Furthermore, the terms for boy's older brother and boy's younger brother are not less difficult for their cultural importance. Similarly, the terms for older siblings were not easier than the terms for younger siblings, although older could be considered more salient in Zinacanteco culture than younger.

Now let us look at the effects of the specific components. If sex of reference point were problematical in the learning of kin terms, we would expect other-centered questions that involve a reference point of a different sex from the child to be more difficult than other-centered questions involving a reference point of the same sex, for the child must learn terms different from those he uses in talking about his own siblings. But questions involving a reference point of a different sex were no harder. That is to say, a girl was as likely to answer a question correctly about a *boy's* older brother as one about a girl's older brother.

Thus far we have only considered whether children answered questions correctly or not, and have not dealt with the nature of their incorrect answers. These can be divided into two categories: errors of omission (omitted-answers) and commission (wrong answers). Errors of commission were relatively infrequent—only a total of 89 out of 835 errors (counting all required answers on multiple-answer questions). Thus, only 11% of all errors were errors of commission, a fact which indicates that there was very little guessing in response to our questions. But errors of commission are of particular interest because they can be used to see whether the participants of various ages have analyzed sibling terms into various components. A pattern in errors of commission reveal the existence of a concept, as opposed to knowledge of specific examples. Table 11–3 organizes errors of

Table 11–3
Errors of commission at different ages*

	Maintain common parentage	*Maintain right sex*	*Maintain relative age*	*Stays within reciprocal pair*	*Number of questions*
Age 4–5	75%	46%	38%	23%	20
Age 8–10	94%	80%	16%	30%	55
Age 13–18	100%	79%	21%	14%	14
					89

*The percentages do not add up to 100 because each one represents a binary split of the complete data for a particular age group. The small number of errors that referred to people outside the sibling group were not included on the age, sex, and reciprocity analyses, because we sometimes did not know who they were.

commission according to which semantic component is maintained. The semantic components refer to the componential analyses described in the introduction. If the experimenter asks a boy "What is your older brother's name?" and he responds by naming a younger brother, his answer maintains the sex (male) of the correct answer and stays within the same reciprocal pair (older brother/younger brother). If he had responded by naming his older sister, he would have maintained the relative age of the correct answer (older) but not sex and reciprocal pair.

The only semantic component consistently maintained by the youngest children is common parentages; that is, they infrequently name people outside their sibling group in answer to sibling questions. The middle and oldest groups maintain the attribute of sex as well. Relative age and reciprocal pairs are not maintained by any age groups. Thus, in terms of psychological validity, none of the three models of componential analysis (two by Collier and one by Haviland and Clark) is completely supported by the results; relative age and/or reciprocity would be needed to complete any of the three analyses. The fact that common parentage is the first feature to be maintained in errors of commission disagrees with both Piaget (1928) and Haviland and Clark (1974), who state that categorical features—sex in this case—should appear first. But common parents are common to *all* sibling terms, and it could be that the core is the first aspect of a concept to be learned. The fact that only sex and parentage are maintained in errors of commission shows that kin terms can be learned through actual examples without the child analyzing a term into its semantic components. Understanding of all the terms in ego-centered usage is possible as early as age 4 or 5 before any semantic component except common parentage stands out in errors of commission. Applying a term in a comprehension situation evidently does not require the awareness of semantic features necessary for definition (Piaget, 1928; Haviland and Clark, 1974).

DISCUSSION

Our results confirm Piaget's theory of the development of kin concepts very strongly, for we have found evidence of decentration and the corresponding development of reciprocity and reversibility as Zinacanteco children acquire skill in applying sibling terms. This result is particularly interesting because the Zinacantecos have system of sibling terminology totally different from the French system on which Piaget's original research was based. Thus, decentration is central to the development of kin concepts for the Zinacantecos of Mexico, just as it is for the Hausa of Nigeria (LeVine and Price-Williams, 1974). Price-Williams, Hammond, Edgerton

and Walker (in this volume), using a method similar to that of LeVine and Price-Williams (1974), report a similar pattern of development.

The development of memory was another important and independent factor in the ability to answer questions. The results of this study lead to the conclusion that Piagetian concepts and other notions of general developmental processes can be demonstrated cross-culturally when they are tested in a realm that is meaningful for members of a particular culture.

On the other hand, the results did not support the validity of any single componential analysis nor reveal the influence of any culture-specific factors.

Danziger (1957) and Haviland and Clark (1974) have found an early stage in definition of kin terms—before semantic components appear—when the child can name examples of terms but cannot define them. In essence our task required naming rather than definition. Our results suggest that children learn kin terms as labels for specific relations before the labels themselves are organized into the conceptual components revealed in their errors of commission.

We found that children could construct reciprocal pairs of relations between people without utilizing the concept of reciprocity. The kind of reciprocity identified by Piaget (1928), Danziger (1957), Elkind (1962), and Haviland and Clark (1974) in the reciprocal stage of children's definitions (e.g., "To have a sibling you must be one") is a very conscious and aware use of a reciprocal relationship. The development outlined in our paper demonstrates a progression in children's use of terms in their daily life which can form the basis for the later acquisition of reciprocity and reversibility on a more conscious plane.

Development in the application of kin terms differs in other respects from definitional development. Whereas very young children will define brother as "boy" (Piaget, 1928), our results for errors of commission show that they will not think that a brother can be any boy whatsoever. Nelson (1973) has found that a new word is first used to refer to something in a particular functional relationship to the child, but that generalization to new instances will first occur on the basis of perceptual attributes. If we consider definition a form of generalization, then this would account for Piaget's (1928) and Haviland and Clark's (1974) findings that the earliest definitions of kin terms refer to perceptual attributes like sex (e.g., defining brother as a boy). However, earliest comprehension involves referents that are of functional importance to the child.

It is interesting and somewhat surprising that our results manifest clearly the influence of supposedly universal processes, like decentration and memory development, but do not show any effect of the distinctive features of the Zinacanteco environment—either the three dimensions in

their system of kinship terms or the cultural emphasis on the older/younger distinction. Perhaps the lack of influence of culture-specific factors relates in some way to the universal importance of kinship as the basis for all human societies.

NOTES

1. LeVine and Price-Williams actually speak of "ego-centered kin terms" and "other-centered kin terms." This, however, is incorrect, as they are really talking about a single set of kin terms used in two different kinds of situation. Therefore, it would have been more accurate to contrast ego-centered and other-centered *use* of kin terms.

2. As Price-Williams, Hammond, Edgerton and Walker point out elsewhere in this volume, whether or not componential analysis *should* have psychological reality has been a matter of controversy within cognitive anthropology. While anthropologists like Wallace have made psychological claims, others like Burling have seen it as a purely formal tool.

3. For those other-centered questions involving a reversal of the child's own perspective, the unschooled 8- to 10-year-olds do better than the school children of the same age—67% correct vs. 29% correct. It is not clear why this isolated difference in favor of Zinacanteco traditional education should have occurred, although kinship is, of course, important in the traditional process of socialization.

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