Cultural Teaching: The Development of Teaching Skills in Maya Sibling Interactions

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Psychology has considered the development of learning, but the development of teaching in childhood has not been considered. The data presented in this article demonstrate that children develop teaching skills over the course of middle childhood. Seventy-two Maya children (25 boys, 47 girls) ranging in age from 3 to 11 years (M = 6.8 years) were videotaped in sibling caretaking interactions with their 2-year-old brothers and sisters (18 boys, 18 girls). In the context of play, older siblings taught their younger siblings how to do everyday tasks such as washing and cooking. Ethnographic observations, discourse analyses, and quantification of discourse findings showed that children’s teaching skills increased over the course of middle childhood. By the age of 4 years, children took responsibility for initiating teaching situations with their toddler siblings. By the age of 8 years, children were highly skilled in using talk combined with manual demonstrations, verbal feedback, explanations, and guiding the body of younger learners. Children’s developing competence in teaching helped their younger siblings increase their participation in culturally important tasks.

INTRODUCTION

Children learn about their environments with the help of others in the process of socialization. Adults are said to provide a scaffold of help upon which children can accomplish tasks that they would not be able to accomplish on their own (e.g., Rogoff, 1991; Vygotsky, 1978; Wood, Bruner, & Ross, 1976). Cultural learning (Kruger & Tomasello, 1996; Tomasello, Kruger, & Ratner, 1993) requires contexts in which children can engage their new world, but also requires others to act as teachers. Psychologists have considered the development of learning, but the development of teaching (e.g., the development of skill in scaffolding) has not been considered. Although the capacity to teach is basic to the transmission of human culture, few studies have explored the roots of teaching in childhood.

The theory of cultural learning (Tomasello et al., 1993) was postulated to link children’s development to their increasing participation in cultural activities. In cultural learning, the focus is on the attainments of children learners that make them able to internalize important aspects of culture, or in other words, to acquire culture. In cultural teaching, the focus is on the examination of the local discourse practices, the social ecology of development, and the material aspects of the environment that make cultural learning possible. The way that cultural teaching develops in children’s daily routines was the central focus of the research presented in this article.

Children acquire patterns of thinking and communicating in their interactions with more competent members of their culture, within the zone of proximal development (Rogoff, 1990; Vygotsky, 1978). Through their increasing participation in interactions with more competent others, children appropriate patterns of behavior and thus acquire the means to become competent members of their communities themselves. An important question concerns the ways in which the ability to provide appropriate help to a less experienced member of the culture develops during childhood.

Numerous studies of children’s cognitive and social development in the preschool years have indicated dramatic increases in skills that would be important in the developing ability to teach. During the course of development, children experience major gains in intersubjectivity (Gopnik & Meltzoff, 1994; Trevarthen & Logotheti, 1989), linguistic competence (Goodluck, 1991), and cognitive and sociocognitive attainments (Piaget, 1952, 1967; Rogoff, 1990), all skills that can be used by children as they teach others. One of the most sophisticated teaching skills that must develop is the skill of scaffolding (Rogoff, 1990; Rogoff, Mistry, Göncü, & Mosier, 1993). Children must be able to understand what younger children know and don’t know to provide the most appropriate kind of help.

Children’s peer interactions can be beneficial to their acquisition of these cognitive and social skills (Corsaro, 1985; Goodwin, 1990; Rogoff, 1990; Vygotsky, 1978). Sometimes peers teach each other as they engage in activities, indicating that they do have some early teaching skills. For example, children’s work as peer tutors provides a glimpse into children’s skills in
teaching (Foster-Harrison, 1995; Johnson & Bailey, 1974). Siblings, especially, can be effective peer teachers of their younger siblings because they are related, are often emotionally close, and are close in age (Meisner & Fisher, 1980).

The goal of the present study was to examine the role of older siblings in teaching their younger siblings to become competent members of their culture by guiding them in cultural activities. It was reasoned that sibling interactions in a sibling caretaking society would provide the greatest opportunity to observe sibling guidance. This is because sibling caretaking is a highly valued form of childcare that allows parents to do other work to support the family economically (Zukow-Goldring, 2002), while older siblings teach younger children to do culturally important tasks, such as weaving (Greenfield, Maynard, & Childs, 2000; Zukow-Goldring, personal communication, October 14, 2000). By studying a community that employs sibling caretaking in the social support of children it is possible to examine the development of sibling teaching as it happens, in its natural environment.

The present research was conducted in a community that employs sibling caretaking in the social support of children—the Zinacantec Maya village, Nabenchauk, in the highlands of Chiapas, Mexico. Previous research on weaving apprenticeship among the Zinacantec Maya has given insight into the teaching and learning practices of this group, focusing on an adult model of apprenticeship (Childs & Greenfield, 1980; Greenfield, 1984; Greenfield, Maynard, & Childs, 1999; Greenfield et al., 2000; Maynard, 1996; Maynard, Greenfield, & Childs, 1999). The present research was designed to examine the developmental roots of that adult model and thus chart the course of the development of teaching.

The Role of Siblings in Child Development

The role of siblings in early childhood socialization has received much attention over the last 2 decades (e.g., Abramovitch, Corter, & Lando, 1979; Kendrick & Dunn, 1980; Watson-Gegeo & Gegeo, 1989; Weisner, 1987; Weisner & Gallimore, 1977; Zukow, 1989a; Zukow-Goldring, 2002). Developmental research has focused on the role of siblings in children’s intellectual development (Zukow, 1989b), and on the role of siblings in children’s social and emotional development (Dunn, 1989; Howe & Ross, 1990; Teti & Ablard, 1989; Whiting & Edwards, 1988; Zukow, 1989a).

There are several social effects of the sibling relationship that might influence both the quality and quantity of sibling teaching. Sibling interactions foster children’s ability to comfort, share with, and cooperate with each other (Dunn & Munn, 1986). Children with siblings exhibit more prosocial behaviors—such as perspective taking and sharing—earlier and to a greater degree than children without siblings (Dunn, 1992). Being nurtured by older siblings has been found to predict American children’s later social perspective taking (Bryant, 1987) and to have a positive effect on children’s school behaviors and adjustment (Gallimore, Tharp, & Speidel, 1978; Weisner, Gallimore, & Jordan, 1988). Children who interact with an extended kin network (including multiple siblings) are precocious in their acquisition of false belief compared with those who interact with a more limited kin group (Lewis, Freeman, Kyriakidou, Maridaki-Kassotaki, & Berridge, 1996). Younger siblings imitate older siblings more than they are imitated (Pepler, Abramovitch, & Corter, 1981), and they receive guidance from older brothers or sisters (Zukow, 1989b) rather than the other way around. These social and perspective-taking skills are likely to be reflected in sibling teaching, especially in a sibling-caretaking community such as Zinacantan, where older siblings are given the role as helpers of their younger siblings. It is likely that the help given to younger siblings is instrumental in the older children’s teaching of the younger children. Helping behaviors provide a context for teaching to occur.

Sibling caretaking provides children the opportunity to demonstrate that they are competent cultural members by engaging their charges in appropriate activities (Zukow, 1989b; Zukow-Goldring, 2002). Ethnographers working in agrarian societies all over the world have noted the widespread use of sibling caretaking, starting when the sibling caretaker is as young as age 3 (e.g., Gaskins, 1999; Martini, 1994; Watson-Gegeo & Gegeo, 1989; Weisner & Gallimore, 1977; Whiting & Edwards, 1988; Whiting & Whiting, 1975; Zukow, 1989a; Zukow-Goldring, 2002). In their pioneering study of children in six cultures, Whiting and colleagues (Whiting & Edwards, 1988; Whiting & Whiting, 1975) quantified sibling behaviors and made general descriptions of the roles that siblings in various cultures play while caring for a younger child.

Sibling caretakers do more than address the biological needs of their charges (Zukow-Goldring, 2002). For example, in a study in Central Mexico, Zukow (1989a) described examples of older siblings engaging their younger charges in more advanced play than that which the younger ones had been previously engaged in on their own. In the Marquesas, Martini (1994) found that sibling caretakers socialize each other to become competent at managing stratified social roles, respecting the complex social hierarchy of Marquesan culture. Sibling caretakers intro-
duce younger siblings to new languages, language routines, and appropriate ways to behave (Ochs, 1988; Watson-Gegeo & Gegeo, 1989; Zukow-Goldring, 2002). Thus, siblings have been found to teach each other in very useful ways. In Hawaii and in a Navajo group, children’s teaching experiences as sibling caretakers have been translated into improved learning environments in schools (Gallimore et al., 1978; Tharp, 1994; Weisner et al., 1988).

The present study is the first known to describe and examine the development of teaching over a cross-section of ages from 3 to 11 years. A meta-analysis of the literature indicates that most studies have focused at a particular age, chosen for each study. For example, Stewart (1983) studied 8-year-olds who were teaching 6-year-olds to use a toy camera. A few studies compared adult teaching with sibling teaching, when the teacher–siblings were age 6 and the learner–siblings were age 6 (Perez-Granados & Callanan, 1997); and when the teacher–siblings were age 9 and the learner–siblings were age 6 (Cicirelli, 1976). The siblings in Perez-Granados and Callanan’s study more often just did the task for their younger sibling, rather than acting as a guide for the sibling to help the sibling accomplish the task by him- or herself. This may be because the sibling role in the U.S. majority culture does not include the sibling as a guide or teacher for the younger one.

In studies in which the focus was on the development of peer teaching or collaboration and not sibling teaching per se, the researchers only tested children in a limited age range: 24 to 42 months (Ashley & Tomsello, 1998); infant toddler peers, 12 to 30 months (Brownell & Carriger, 1991); or 9-year-old children (Ellis & Rogoff, 1982). One study compared siblings and peers as agents of cognitive development by watching the collaborative activities of 9-year-olds with 7-year-olds (Azmitia & Hesser, 1993).

None of this previous work looked at the moment-by-moment socialization practices of siblings, tracing the developmental progression of sibling socialization across a range of ages. In addition, no study has described how siblings at various developmental stages organize events and guide one another in the joint co-construction of activities. The current study was designed to fill this gap by showing how older siblings develop the skills to participate in an apprenticeship process or socialization of younger children.

The Study Site: Nabenchauk, Zinacantán

There is a long tradition in the study of apprenticeship in Nabenchauk. For example, Greenfield and Childs (Childs & Greenfield, 1980; Greenfield, 1984) first analyzed the processes of Zinacantec teaching and learning in the domain of weaving. Childs and Greenfield (1980) demonstrated the particular verbal and nonverbal variables that were important as adults taught girls to weave, focusing on commands, explanations, questions, declaratives, and positive and negative reinforcement. Of particular interest is that the command form was the most used discourse form; teachers expected obedience from their pupils. There was little verbal explanation and almost no extrinsic verbal reinforcement, such as praise or criticism. Childs and Greenfield also discussed the highly scaffolded nature of Zinacantec weaving apprenticeship, whereby a teacher helps a learner accomplish a task by providing help that is sensitive to the learner’s stage of acquisition.

The Zinacantec model of teaching and learning (Maynard, 1996) is based on the work of Childs and Greenfield (1980) as well as my own ethnographic fieldwork in Nabenchauk. The model includes such features as the expectation of obedience, scaffolded help, observational learning, contextualized talk, teacher and learner bodily closeness, and having more than one teacher for a given task; and reflects an overall pattern of apprenticeship that centers around helping younger members of the culture become more competent participants in cultural activities. This study was designed to chart the development of this cultural model in childhood.

It was hypothesized that children would approach the adult Zinacantec model of teaching (Maynard, 1996) as they matured. Just as the model is acquired and used in the apprenticeship of weaving skills, the current study examined its use in socialization practices. A further goal was to chart its acquisition and use by developing children. Older children’s teaching was expected to approach the teaching of adults, with a greater expectation of obedience (demonstrated by the issuance of commands), more scaffolded help, and bodily closeness.

Children’s use of effective discursive teaching acts, involving intersubjectivity, linguistic competence, and cognitive and sociocognitive attainments, was hypothesized to increase with age. For example, children were expected to use more appropriate verbal discourse as they developed stronger communication skills. As another example, children’s abilities to simplify a task for another child were expected to increase over middle childhood as they gained a greater ability to take the perspective of another.

In this study, children’s interactions were analyzed by discourse analyses, to get a picture of their cognitive and sociocognitive attainments as they were revealed in their social practices (Goodwin & Goodwin,
Discourse analysis involves the microanalytic examination of communication processes in context, which includes settings, tools, and participants. Many researchers in child development have used discourse analysis to explore aspects of development; for example, language development (Ochs, 1988; Woolton, 1997), processes of social interaction in childhood (Goodwin, 1990), language socialization (Ochs & Schieffelin, 1984), and sibling socialization (Zukow, 1986, 1989a; Zukow-Goldring, 1997). A picture of the development of communicative practices over the range of ages in this study was produced by careful analyses, both quantitative and qualitative, of the children’s discourse strategies. Quantitative analyses of discourse processes were used to chart the development of the children’s verbal and nonverbal teaching abilities. Qualitative examples richly illustrate the quantitative findings, showing how each of the discourse variables is used by children in the different age groups.

METHOD

Participants

Participants were members of 36 Zinacantec households in the hamlet of Nabenchauk, Zinacantán (population approximately 4,500). Each household had an average of five children. The availability of siblings increased the likelihood of observing teaching. Participants were 108 Zinacantec Maya children ranging in age from 20 months to 11 years. Of these, 36 (18 girls and 18 boys) were aged 20 to 36 months (M = 24 months); hereafter these are referred to as the focal children. There was just 1 focal child per household. An additional 72 children (25 boys and 47 girls) were siblings who interacted with these focal children. They ranged in age from 3 to 11 years (M = 6.8 years). A few cousins and one 6-year-old aunt who interacted with the focal children were included because they were often the child’s primary sibling caretaker, sharing the household or the extended-family compound. All the older siblings, first cousins, and the young aunt are hereafter referred to as the “siblings” or “teachers” to simplify description. The teaching behavior of these older children with respect to the focal children was the focus of the present study.

The 72 siblings of the focal children came from a total pool of 93 siblings (age: M = 8.3 years) in the required age range who might have interacted with the focal children. The total pool of siblings was derived from the genealogical information collected in family interviews. There were fewer boys than girls in the sample for two reasons. First, Zinacantec boys are not primary sibling caregivers when girls are available, so several boys who were present did not interact with the focal children during the study procedures. Second, some boys were not present because they were away at school or away selling peaches at a market. Fewer girls in the sample went to school or away on selling trips without their nuclear family groups; therefore girls were more likely to be available as sibling caretakers.

Procedure

Participants were recruited on a volunteer basis with the help of an indigenous field assistant who went to the homes of families with 2-year-olds and asked if they would be interested in talking about their possible participation in the study. Recruitment was aided by word-of-mouth discussion of the study in the village.

Participants were observed one time with a video camera in their own homes or courtyards for a period of 1 hr. During videotaping, most mothers carried out their usual domestic routine. Some mothers stayed close by the children and watched the interactions. Mothers were always within earshot of the children, often inside the house while the children were outside.

To reduce the intrusive effect of the observer and the camera, the observer paid at least one visit to the home before conducting the videotaped observation, and did not begin the recording session until at least 10 min after arrival. In the first visit to the home of each family, participants were shown the video camera and how it worked. The observer told the families that the main interest was in watching what the children did during the day. Mothers were interviewed about the ages and schooling experience of each person in the household.

Each family was paid 25 pesos (about U.S. $3.25 at the time of the study) for their participation. In addition, the observer took photographs of family members to give to them as part of payment. Paying the participants may have affected the children’s activities: their frequency of play may have increased because the families knew that the children were being watched, and play was a readily available activity for children to do. Even if this was the case, it would not have an effect on the developmental comparisons that are the focus of this article. Moreover, it is not believed that the content of play changed as a result of the observer’s presence or payment to participants. Mothers reported similar play at times outside of the observation session, and many of the same children were seen playing similar activities in their homes.
and around the village on days other than those during which they were observed.

Data Analysis

Video data were analyzed using the vPrism software system, which was designed specifically for video analysis of behavior (Stigler, 1988). The first step in the analysis was to extract the teaching episodes from the longer tapes. Teaching was defined as any activity attended to by the younger child that had the possible effect of transmitting cultural knowledge. To track the developmental change in teaching skills, the definition of teaching encompassed both intentional and unintentional teaching. Thus, the younger child had to be paying attention to the activity of the older child, but the older child did not have to engage the younger child explicitly for the segment to be considered a teaching segment. The teaching segments were operationally defined in two ways: (1) any task that an older sibling drew the younger child’s attention to, either verbally or nonverbally; or (2) any activity that older children were performing next to or “side-by-side” with the 2-year-old, such that the 2-year-old might learn something about the activity from observation of the older child and from practicing next to the older child and using the older child as a model. Data meeting the second criterion were included to obtain a baseline measure of what kinds of teaching skills the youngest teachers exhibited or did not exhibit. For example, many of the 3- to 5-year-olds engaged in side-by-side activity with their younger siblings. They set out tasks for their younger siblings but, in many cases, did not engage them further, either verbally or nonverbally; the children just performed the activities side-by-side. Older children, however, engaged the younger children, both verbally and nonverbally, carefully guiding them in the tasks.

The teaching session was deemed to have begun when the teacher first tried to get the attention of the focal child to engage him or her in a task or when the older child (teacher) began the task next to the focal 2-year-old, who was paying attention to the older child. Thus, the beginnings of episodes were marked by either verbal or nonverbal actions. The endings of teaching episodes were marked when the focal child left the scene of the teaching episode, when the older sibling (teacher) left the scene of the episode without returning, or when any child shifted tasks, thus beginning a new episode with a different activity.

Almost all interactions between older siblings and 2-year-olds were considered teaching episodes, including episodes that an observer might label “play.” The teaching episodes analyzed in this study fit into a larger category of multiage play. The teaching episodes were thus one subclass of the larger category of play.

Play became synonymous with sibling teaching in this study because there was so much teaching in the multiage play. Older children always took on the responsibility of showing the younger child how to do a particular task so that the younger child could participate in the play situation. Therefore, a more precise term for these interactions was “teaching,” even though the episodes were still a part of the larger category of play. Some interactions between older siblings and 2-year-olds were not considered teaching; for example, when the older child provided care that did not involve any teaching (e.g., carrying a toddler to the mother to nurse or helping the younger child with toileting). There were also other types of play that did not involve teaching; for example, children age 4 and older played games and engaged in activities (soccer, “curing ceremony,” throwing rocks, and so forth) that did not involve 2-year-olds, who were not able to participate without help, due to their limited skills and abilities. Thus, only play with 2-year-olds was included in this study, and that play usually involved older siblings teaching younger ones to do everyday things.

There were 158 teaching episodes in the 36 hr of tape, which produced a total of 12 hr, 8 min, 15 s of teaching episodes that were included in the analyses. Teaching episodes ranged in length from 11.9 s to 32 min, 9 s, with a mean length of 10 min, 7 s. The teaching episodes were transcribed and coded for measures of the development of teaching skills. Children taught everyday tasks such as washing, cooking, taking care of baby dolls, and making tortillas. All teaching episodes involved objects, ranging from dirt and leaves to household items such as tortilla presses and articles of clothing to items purchased specifically for children such as dolls and toy trucks.

Measures: Variables Used in Quantitative Discourse Analysis

Children’s discourse was measured by verbal and nonverbal variables. Several of these variables were used by Childs and Greenfield (1980) in their study of weaving apprenticeship in Zinacantán. The variables also reflected features of the Zinacantec model of teaching and learning. The mutually exclusive and exhaustive codes for the variables are listed (with examples) in Table 1. Each variable reflected some aspect of cognitive development, such as the ability to take the perspective of the younger child to provide the correct guidance in the task. The verbal discourse variables were commands, explanations and descriptions, feedback on the child’s performance, and praise.
or criticism. The nonverbal discourse variables were simplifying the task nonverbally, and guiding the child’s body in the desired task. One variable—talk with demonstration—involved the coordination of both verbal and nonverbal information. Teacher initiation of an episode could be either verbal or nonverbal.

Commands. Commands are an important part of teaching. It was expected that teachers would tell the focal children to perform a task by giving a command. Previous research has found that older siblings produce more directives than do younger siblings when they play together (Tomasello & Mannle, 1985). Moreover, commands are culturally normative in Zinacantec child socialization (Blanco & Chodorow, 1964; Chilis & Greenfield, 1980); older siblings may issue commands to younger siblings in their charge. Thus, it was hypothesized that older sibling teachers in this study would give commands to their younger siblings when they taught them to do things. Commands indicate that the older child knows that the other can understand language and assumes that the 2-year-old focal child can follow through on the order and that he knows what the command means.

Talk with demonstration. This variable, which has been used in other studies of children’s interactions (e.g., Zukow, 1989b), was identified when teachers demonstrated what they wanted the focal children to do (physically) and simultaneously said something relevant to the action. Talk with demonstration was coded separately from nonverbal task simplification.

Explanations and descriptions. Explanations and descriptions were indicated by teachers’ statements of the reason they were doing a particular activity, of the way an activity should be done, or of the outcome or final state of the activity being taught. Childs and Greenfield (1980) found that explanations and descriptions (which they called statements) were rather infrequent in Zinacantec weaving apprenticeship. Explanations and descriptions were included together in one category because they are both kinds of talk about the task being taught. As part of a category of metatalk about activities, explanations and descriptions were hypothesized to develop together.

Feedback. Feedback was indicated by teachers’ positive or negative comments that guided focal children’s behavior. Feedback included comments such as, “Like that” or “Not like that.” Such comments were usually followed by talk with demonstration. Utterances considered as feedback in this study were coded by Childs and Greenfield (1980) as vague positive and negative commands. Feedback was coded separately in the present study because it did not always involve an explicit command for action.

Praise and criticism. Separate from feedback, praise and criticism are verbal measures of explicit evaluations, for example, “Good” or “Bad.” Childs and Greenfield (1980) had found that there was virtually no praise or criticism in Zinacantec weaving apprenticeship. Likewise, it was expected that there would be little or no overt praise or criticism in the sibling teaching interactions.

Simplifying the task nonverbally for the learner. This variable was indicated when teachers broke down a task into simpler parts, for instance, when they managed the teaching situation by presenting simpler parts of a task first.

Guiding the body. This variable indicated the instances when teachers touched the bodies of the focal children to guide them in performing a specific activity. Zukow-Goldring and Ferko (1994) used this variable in their study of the socialization of attention.

Teacher initiation. Teacher initiation was another way of looking at the role of age in teaching. There is a pervasive Zinacantec cultural norm of respect for elders (Vogt, 1969, 1990) that would lead younger children to defer to

<table>
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<tr>
<th>Measure</th>
<th>Examples</th>
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<tbody>
<tr>
<td>Verbal</td>
<td>Commands (without a demonstration) “Wash!” “Put it in there!”</td>
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<td></td>
<td>Explanations / descriptions “Hold the baby because it has a fever.” “We are finished washing!”</td>
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<td></td>
<td>Feedback on the child’s performance “Yes, like that!” “No, not like that!”</td>
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<tr>
<td></td>
<td>Praise and criticism “Dummy!” “[That’s] bad!”</td>
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<tr>
<td>Nonverbal</td>
<td>Task simplification Child pours water from a large container into a smaller container that is easily held by focal child. When teaching how to make tortillas, child tears leaves off a branch and gives the leaves one at a time to focal child, rather than handing the child the whole branch.</td>
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<td></td>
<td>Touching / guiding the child’s body Guiding child’s hand in a washing motion. Folding child’s legs under her to get her to kneel.</td>
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<tr>
<td>Verbal and nonverbal</td>
<td>Talk with a demonstration “Pat [the tortilla] like this” [as teacher pats out a tortilla]. “I’m washing!” [as teacher washes a rag].</td>
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<tr>
<td>Verbal and/or nonverbal</td>
<td>Teacher initiation of episode The age and gender of the child who initiated the episode are coded.</td>
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older children to initiate episodes of play. This measure 
was also a test of the development of respect for elders; 
if younger children defer to older children to initiate 
play episodes, it may indicate respect for their authority. 

For the quantitative analysis, frequency counts 
were taken of each of the measures and then divided 
by the number of minutes each teacher was involved 
in a teaching activity to control for overall time spent 
teaching the younger child.

Reliability

The principal investigator (A.E.M.) coded both the 
quantitative and qualitative data. An independent 
coder, fluent in the Tzotzil language and unaware of 
the hypotheses, coded 25% (N = 9) of the videotapes. 
Interrater agreement for the number of episodes, as-
essed by percentage agreement, was 95.2% (40 out of 
42). There was one disagreement in which the prin-
cipal investigator indicated two separate shorter epi-
sodes and the independent coder indicated only one 
long episode. The second disagreement was when the 
principal investigator thought there was an episode 
of teaching when the independent coder did not.

Interrater agreement for the duration of episodes 
was assessed by examining the two raters’ beginning 
and end points of every episode in which there was 
agreement that there was an episode, and comparing 
the number of seconds of disagreement. For the be-
ginning points of episodes, the disagreements ranged 
from .66 s to 29 s, with a mean of 10.7 s. For the end 
points of episodes, the disagreements ranged from 1 
to 30 s, with a mean of 11.8 s.

Interrater agreement for the discourse measures 
was assessed by Cohen’s κ. For all the discourse mea-
sures taken together, κ = .80 (percentage agreement 
was 84.6%) for all the discourse variables in Table 1 ex-
cluding praise/criticism, which occurred too infre-
fquently in the reliability observations for assessment). 
This κ value was considered to be indicative of excel-
lent reliability (Bakeman & Gottman, 1986).

RESULTS

Quantitative Analyses

For purposes of statistical analysis, the codes for 
the discourse variables were divided by each teacher’s 
time spent in teaching. There were no differences across 
the age groups in time spent in teaching, F(2, 69) 
= 1.93, p = .153. This nonsignificant difference reflects 
two features of sibling caretaking in Nabenchauk: its 
beginning at age 3 or 4 and its importance and preva-
ience until approximately age 10. The nonsignificant 
differences in time spent in teaching also made the 
analysis and interpretation of the discourse variables 
easy and straightforward: because there were no dif-
fferences in time spent in teaching—the denominator 
of all discourse measures of the study—the discus-
)ion of the results is focused on the dependent mea-
ures in question.

There were natural breaks in the means for most of 
the variables between ages 5 and 6, and between ages 
7 and 8. Therefore, participants were divided into 
three groups: 3- to 5-year-olds (n = 19; M = 4.26 
years), 6- to 7-year-olds (n = 20; M = 6.25 years), and 
8- to 11-year-olds (n = 33; M = 8.61 years).

Talk with demonstration, commands, explanations, 
feedback, guiding the learner’s body, and teacher ini-
tiation were included in a MANOVA with the factors 
of age and gender. There were no effects of gender. 
With the use of the Wilks’ criterion, the combined de-
pendent variables were significantly related to the fac-
tor of age, F(12, 108) = 3.40, p = .001. Univariate F 
tests for each of the six discourse variables indicated 
four individually significant effects. There was a sig-
nificant relation between the factor of age and teacher 
talk with demonstration, F(2, 60) = 5.37, p < .01, ex-
planations, F(2, 60) = 9.22, p < .001, feedback, F(2, 60) 
= 6.34, p < .01, and teacher initiation, F(2, 60) = 3.4, p < .05. 
The developmental progression from the youngest 
age group to the oldest age group can be seen in the 
marked differences between the age groups (Figure 1).

The significant results from the MANOVA were 
Further analyzed by Bonferroni t tests to find specific 
ter group differences. For talk with demonstration 
there was a significant difference between the young-
est age group, the 3- to 5-year-olds (M = .238), and the 
oldest age group, the 8- to 11-year-olds (M = 1.32), 
t(50) = 3.26, p < .001. The two older age groups, 6 to 
7 (M = .526) and 8 to 11 (M = 1.32) were also signifi-
cantly different from each other, t(51) = 2.63, p < .01. 
Middle children (M = .526) did not differ significantly 
from youngest children (M = .238), t(37) = 1.19, p = .24.

There were also significant relations between age 
and explanations. The oldest age group (M = .691) 
gave explanations or descriptions significantly more 
more than did the middle age group (M = .171), t(51) = 3.00, 
p < .005, or the youngest age group (M = 0), t(50) 
= 4.11, p < .001. The middle age group (M = .171) also 
gave explanations significantly more than did the 
youngest age group (M = 0), t(37) = 2.29, p < .05.

Oldest children (M = .636) gave significantly more 
feedback than did middle children (M = .092), t(51) 
= 2.81, p < .01, and youngest children (M = .024), t(50) 
= 3.10, p < .005. Middle children (M = .092) gave the 
same amount of feedback as youngest children (M = 
.024), t(37) = 1.68, p = .10.
Praise and criticism were evaluative comments coded separately from positive and negative feedback. There was no overt praise in the entire database. There were only two instances of criticism. In one, a 6-year-old girl said, “Chopol [That’s bad]” in response to her 2-year-old sister’s attempt at making a tortilla with leaves. The older child thought the focal child was tearing off the wrong leaves to use for the tortillas. In the other instance of criticism, a 9-year-old girl said, “Chich [Dummy]” to the focal child when she did not do a cooking activity properly.

Oldest children ($M = 2.61$) and middle children ($M = 2.60$) initiated significantly more teaching episodes than did youngest children ($M = 1.05$), $t(50) = 2.63, p < .01$, and $t(37) = 2.40, p < .05$, respectively. Oldest children ($M = 2.61$) and middle children ($M = 2.60$) did not differ significantly from each other, $t(51) = .01, p = .993$.

Nonverbal task simplification increased as a function of age, $F(2, 69) = 4.353, p < .05$. None of the 3- to 5-year-olds used task simplification in their teaching, whereas 2 (10%) of the 6- to 7-year-olds and 15 (45.5%) of the 8- to 11-year-olds used task simplification to help learners with the tasks.

Qualitative Analyses of the Discourse Variables by Age Group: Three Examples

As previously discussed, there were significant relations between age group and four of the discourse variables. This section presents examples of teaching episodes with 1 child from each of the three age groups: 8- to 11-, 6- to 7-, and 3- to 5-year-olds. A more complete corpus is found in Maynard (1999). The episodes are matched closely for duration (approximately 2 min each). Each example is of a child teaching a 2-year-old how to wash a baby doll. Each pair of children is from a different nuclear family. In the following transcripts the Tzotzil transcription is presented first, followed by the English gloss. Nonverbal information is also indicated in double parentheses. Tzotzil orthographic conventions and transcription conventions are listed in the Appendix.

**Example 1: Age 8.** In the first example, 8-year-old Tonik teaches 2-year-old Katal how to wash a baby doll using task simplification, talk with demonstration, and commands.

Tonik: ((Laughs. Brings over a glass of water, to wash the baby doll.))

Taso. Taso.

Take it out. Take it out (of the water).

Xivi.

Like this. ((Katal watches.))

Tonik/Katal: ((Four hands on the glass, in position to pour, but they don’t pour together at this time.))

T: Cakel=vi.

You watch=look.

K: ((Watches.))

T: Xitovi. ((Pouring the water herself, Katal watches.))

Like this.

[K’embo xivoi.

[Pour like this. ((Pouring, laughs.))]

T/K: ((Four hands are on the glass.))

T: ((Moves doll into position that is easier for Katal to pour accurately.))
Maynard 977

T/K: [((They pour together.))]

T: [K’embo’un!]
Pour it now!
Caklie.
Like that.
Ihtaso’un.
I took it out.
Cataso’un.
You take it out.

K: e, ee ((Baby-talk sounds; requests more water by reaching for glass.))

T: Cakan to.
You want some more.
((Goes to get more water and comes back.))
Va’i un.
Understand!
Va’i.
Understand. ((Hands Katal the water, still supporting the glass.))

T/K: ((Three hands on glass, two are Tonik’s. Water pours out toward the back of the frame.))

T: Vi’i!
Look! ((Laughs at the error of water pouring the wrong way.))
Pulo vo’ota, Xunka’.
You draw some water, Xunka’. ((Spoken to other sister who is present.))
Tas caklie. Atintaso.
Take it out like that. Take it out and wash it.

K: ((Washes baby with washing motion of hand.))

T: Caklie.
[Like that.]

K: (Reaches for glass.)

T: Lah xa. ((Pours from the empty glass, showing that glass is empty.))
It’s finished already.
Vi.
Look.

K: ((Washes baby doll with washing motion.))

T: Ani’ un.
Hurry up! ((To other sister who is drawing water.))
Akbo xa=casutotal ani!
Put the water in already=come back fast! ((Spoken to other sister.))
((Hands Katal an empty glass while they wait.))

Let’s watch! Let’s watch. Like this=Like this=Like this. Take it out like this.

Xunka’: (Comes back with water in a bottle; hands glass to Tonik.)

T: ((Pours water from the bottle into the glass that they have been using to wash.))
((Hands glass to Katal.))

K’embo xitovi ((Taking glass from Katal.))
Pour like this.
Xitowi. ((Repositions doll to make it easier for herself.))
Like this.
Xitowi. Xitowi.
Like this. Like this. ((Pours water over the doll’s head, rubbing doll’s head in a washing motion.))
Atintaso.
Take it out and wash it.
((Hands glass and doll to Katal for Katal to do it.))
Xitowi. K’embo.
Like this. Pour it. ((Repositions the doll to make it easier for Katal.))
K’embo xitovi
Pour it like this. ((Pours water on.))
((Hands glass to Katal.))
C’in, K’embo.
Sister, pour it.
Vi un. K’embo.
Look! Pour it.
Caklie. K’embo sciuk sku’.
Like that. Pour it on its blouse also. ((The baby doll is wearing a blouse.))

K: [((Pours water over the baby, with some difficulty.))]

T: [Caklie.
Like that.

((Puts another bottle in front of Katal, who is looking away.))

Lah xa li’e vi.
It’s finished now, look. ((Deciding the doll is clean, she picks it up.))

In this example, Tonik provided a scaffold of help for the focal child by pouring water for her when she noticed that she was having trouble. She narrated much of what she did, showing and telling Katal what to do. Tonik gave commands that guided Katal in each step of the washing. She also provided descriptive elaborations of actions. She said, “Pour it on its blouse also,” pointing out that the doll was wearing a blouse, and expanding the washing to include the blouse. Tonik was sensitive to Katal’s actions. When Katal picked up the empty glass, Tonik responded by getting her some more water or having another sister draw some water. Tonik also gave Katal some feedback in this example. There were several instances when she affirmed Katal’s actions by saying, “Like that.”

Example 2: Age 7. In the next example, Xun, age 7, uses talk with demonstration and commands to teach Teresa, age 2, to wash a baby doll.

Xun: Teresa—
Teresa ((Holds the baby out to her; they are both touching it.))
Pok’etik nene.
Let’s wash baby! ((As he washes the baby himself.))
Vi. Vi. . . . la jole.
Look. Look . . . the head. ((As he pats the head.))
Vi. La pok’etik li yoke. Pok’etik.
Look. We are washing its foot. Let’s wash. ((Puts the doll in the bowl of water.))
[((He pats the doll’s head, playing with the hair.))

Teresa: 
((Watches.))
((Teresa loses interest, moves away from Xun.))

Like 8-year-old Tonik, Xun used talk with demonstration in his teaching: he pointed out parts of the doll he was washing. One major difference between his teaching and that of Tonik’s was that he did not get Teresa to wash the baby doll herself, whereas Tonik was able to get Katal to do the washing by herself, in carefully simplified parts.

Example 3: Age 4. In the next example, Petu’, age 4, teaches Elena, age 2, how to wash a baby doll. She gives one verbal command to Elena, but does not use any of the other discourse skills used by the older children.

Petu’: Pok’a la nene!
Wash the baby!
((Puts soap and water on the baby doll.))
[((Washes the baby doll’s stomach and back.))
Elena: 
(((Washes a rag, continues to look at what Petu’ is doing.))
P: ((Continues to wash the baby doll.))
E: Tutu. ((Baby-talk name for Petu’, who does not respond.))
Tutu.
P: ((Continues to wash the baby doll.))
E: ((Wanders off.))

This is an example of the developmental beginning point of teaching. Petu’ gave a command to Elena to wash the baby doll, but did not narrate her washing behavior for Elena. She washed the baby doll and allowed Elena to help a little. The episode was short, a little over 1 min, and the teaching was characterized solely by nonverbal demonstration of the activity.

DISCUSSION

There was an overall developmental trend in the use of important discourse skills required for teaching, with children developing toward the Zinacantec model of teaching and learning (Maynard, 1996). As predicted by the study of adult apprenticeship of weaving (Childs & Greenfield, 1980), the children in the present study developed a pattern of teaching that stressed scaffolded help, contextualized verbal explanations and feedback, and obedience, with virtually no praise or criticism. By the age of 8 years, the children in this study used skills that involved an understanding of the other child’s perspective, such as simplifying the tasks for the learners. Children also provided necessary and useful information to the young learners, such as appropriate feedback and narrated demonstrations.

The observable characteristics of the children’s teaching changed over the three age groups. The 3- to 5-year-olds gave the least amount of verbal instruction. Their teaching behavior was mostly nonverbal: They did the task and let their siblings join in right next to them. They sometimes looked to their charges to see what they were doing, but they did not give explicit instruction as to how to do a task or any particular part of a task. The 3- to 5-year-olds were “side-by-side co-operators”; they usually cooperated with their toddler siblings, but they didn’t collaborate or explicitly teach in the way one usually thinks of teaching. Their actions represented the developmental beginning point of teaching.

The 6- to 7-year-olds gave significantly more commands than did the 3- to 5-year-olds. The 6- to 7-year-olds were the “unequal collaborators” or “orchestra- tors of events”; they were unequal in that they worked with the child to make something happen, but gave a lot of commands and did the task themselves if the 2-year-olds didn’t do enough.

The 8- to 11-year-olds demonstrated the skills of adult scaffolding. Their use of commands declined as their use of talk with demonstration increased sharply (Figure 1). They increased their use of evaluations and explanations, and used the body in teaching at helpful moments. They were, by the age of 8 years, already the “guides of development” talked about in so many studies. They were also “administrators of action,” coordinating the actions of the younger siblings around them to do a play task. Perhaps the nature of Zinacantec relationships, with a pervasive emphasis on obedience from younger to older people (Vogt, 1969), helps children develop skills of social coordination.

Ethnographic studies of children’s relationships in cultures in which sibling caretaking is an important part of childrearing have not examined how it is that children teach each other to do everyday things (e.g., Lancy, 1996; Weisner & Gallimore, 1977; Whiting & Edwards, 1988; Zukow, 1989a, 1989b). The literature widely reports that children are not taught (didactically and with language) to do everyday things. Researchers have suggested that everyday skills develop through participation in joint activities (Lave &
Wenger, 1991). For example, Lancy (1996, p. 144) wrote of the Kpelle in Liberia, “No one teaches a girl to wield a hoe.” One might have similarly believed that no one teaches a child to make tortillas or to wash in Nabenchauk. The data presented in this study showed that there is some teaching of everyday activities, at least in Nabenchauk. Although it is true that Zinacantec parents do not teach their children to do everyday tasks, didactically and with language, Zinacantec siblings clearly do. Perhaps there are children in other cultures who teach each other to do everyday things. More exceptions may be uncovered by further study, thus changing the prevailing view of the way that children learn everyday tasks.

The present study on children’s interactions leads to many more questions about the development of their ability to teach. First, examining children’s teaching in its everyday context (without informing the children that their teaching was the focus of the study) might not have pushed the children to be the best teachers they could be. Perhaps a future study could explore children’s teaching first in its everyday context and then with an experimental protocol designed to reflect or be compatible with the children’s daily routines, to see the children’s potential.

Second, the strong sibling relationships may have privileged the teaching interactions reported here. Indeed, Azmitia and Hesser (1993) reported that young children in a collaborative task asked more questions of siblings than of a peer who was the same age as their sibling. The closeness of the relationships in this study may have had an impact on the quality of the teaching. It would be worthwhile to examine children’s teaching with both related and unrelated younger children to begin to further our understanding of the impact of the very special sibling caretaking relationship.

Third, this study focused on the teaching behaviors of the older siblings without systematically analyzing the learning behaviors of the younger children. Although the younger children participated in the activities with their older siblings, their behavior was not analyzed by quantitative discourse analysis. It would be important in a future study to obtain an understanding of the teachers’ effectiveness by analyzing more closely the participation of the younger children.

Conclusion

Related to the development of children’s teaching are processes of cultural transmission and child socialization. This study of cultural teaching has informed our knowledge of the transmission of culture. In Nabenchauk, everyday tasks are learned through more than mere “legitimate peripheral participation” (Lave & Wenger, 1991). The present study validated children’s contributions to each other’s everyday routines in a specific way: by showing the verbal and nonverbal tools that children use to help each other participate in their culture and the developmental trend of these skills. Children create culture at the same time that they are acquiring culture. As they are being socialized by their parents, they are also socializing, in their own way, their younger siblings.

The children in this study developed discourse abilities that they then used to teach their toddler siblings how to do everyday things. These children were learning skills that they will likely perform in adolescence and adulthood, including not only the skills involved in the tasks themselves, but also the skill of guiding learners in everyday tasks. There were aspects of the children’s teaching that were clearly related to their upbringing in Zinacantán, such as the lack of praise and criticism in their teaching. Other factors, such as providing talk with demonstration or simplifying a task for a young learner may be more basic to cultural transmission, and therefore more universal. Future studies of children’s teaching in other cultures will inform our knowledge of the social and cognitive skills that children acquire over the course of middle childhood.

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APPENDIX
TZOTZIL ORTHOGRAPHIC CONVENTIONS
All the Tzotzil vowels are included. The reader should note that each Tzotzil vowel is articulated as a separate sound. Only the consonants that do not have the same orthography in English are included in this list. Other consonants (as they are written in this document) sound almost the same in Tzotzil and English and are, therefore, not included.

Vowels
<table>
<thead>
<tr>
<th>Transcribed phoneme</th>
<th>Example of sound in an English word</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>stop</td>
</tr>
<tr>
<td>e</td>
<td>egg</td>
</tr>
<tr>
<td>i</td>
<td>speed</td>
</tr>
<tr>
<td>o</td>
<td>comb</td>
</tr>
<tr>
<td>u</td>
<td>smooth</td>
</tr>
</tbody>
</table>

Consonants
<table>
<thead>
<tr>
<th>Transcribed phoneme</th>
<th>Example of sound in an English word</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Glottal stop; no such consonant in English</td>
</tr>
<tr>
<td>x</td>
<td>shop</td>
</tr>
<tr>
<td>j</td>
<td>heat</td>
</tr>
<tr>
<td>c</td>
<td>chalk</td>
</tr>
</tbody>
</table>

Transcription conventions
For readability, if the same child has the next turn, the name is not repeated next to the turn.

Convention Meaning
= Speech that is produced in one stream of air; fast speech
(( )) Nonverbal behaviors
[ ] A point of overlap onset between two speakers

REFERENCES


