Chapter 3

An Ethnomodel of Teaching and Learning

Apprenticeship of Zinacantec Maya Women's Tasks

Ashley E. Maynard and Patricia M. Greenfield

INTRODUCTION: HUMAN CULTURAL MODELS

Human cultures have embedded, often taken-for-granted models for behavior, based on features of the ecocultural place which they inhabit (D'Andrade, 1992; Holland & Quinn, 1987; Weisner, 1984). Culture, as a system that informs its members of behaviors required for survival and correct performance, is unique to an ecocultural setting in the world. Several definitions of cultural models are found in the literature. A cultural model can be defined as a "shared, recognized, and transmitted internal representation" (D'Andrade, 1991, p. 230). Cultural models have also been defined as "presupposed, taken-for-granted models of the world that are widely shared by the members of the society and that play an enormous role in their understanding of that world and their behavior in it" (Holland & Quinn, 1987, p. 4). These cultural models are translated into scripts for socializing children along a particular pathway of development (Greenfield, 1994; Greenfield, Keller, Fuligni, & Maynard, 2000).

A cultural model can be likened to a grammar of a language. People know about and use grammar to speak and understand each other, but

they do not state explicitly the grammar of their language without some linguistic training or some other influence that makes their grammar obvious to them. Similarly, people know about and use cultural models to participate in their social environments, but they do not talk about or state explicitly these embedded rules for behavior.

The Acquisition of Human Cultural Models

In the last two decades, a number of researchers have considered human cultural models (e.g., D'Andrade & Strauss, 1992; Holland & Quinn, 1987; Shweder & LeVine, 1984; Stigler, Shweder, & Herdt, 1990) and the acquisition of these models through apprenticeship (Greenfield, 1999; Greenfield, Maynard, & Childs, 2003; Lave & Wenger, 1991; Lave, 1988; Rogoff, 1990). Cultural knowledge, knowledge embedded in language, cultural myths, and cultural tools and artifacts, is learned from and shared with other humans (D'Andrade, 1995). Indeed, acquiring *cultural* competence seems to be one of the most important things for the social survival of an individual (Weisner, 1996).

The acquisition of human cultural models is a large part of this struggle for cultural competence. The understanding of cultural models can give researchers insight into what is important in a culture, what people need to do in order to succeed socially, and perhaps physically, in that culture. Ethnography, which typically includes longitudinal observation and interviewing of people in their own environment, is one method of research useful for the understanding of cultural models (Weisner, 1996; D'Andrade, 1995).

In this chapter, we apply the notion of cultural models to an understanding of cultural apprenticeship, which also lends itself to ethnographic study. Culturally important tasks are often taught in an apprenticeship between a learner and a master. In anthropology, an ethnographic tradition going back to Meyer Fortes (1937) has detailed the acquisition and practice of skills in everyday life (Carothers, 1953; Knapen, 1962). Later on, this tradition was extended by researchers working at the junction of psychology and anthropology (Childs & Greenfield, 1980; Greenfield & Lave, 1979/1982; Lave, 1988b; Guberman, 1996; Modiano, 1973; Rogoff 1990; Scribner & Cole, 1981). These researchers shifted the emphasis in the study of learning from learning by an individual in a classroom to learning by individuals or groups within their everyday cultural settings. Quite significantly, the initial research was done in cultures in which schooling was not indigenous, and out-of-school learning had pride of place. Nonetheless, this work has led to a general rethinking of what it means to learn and to know.

Ultimately, this evidence and line of thinking led researchers to investigate out-of-school learning in the United States (Guberman, 1992; Lave, 1988a; Lave & Wenger, 1991) including the learning and practice of manufacturing, service, and technological skills (Beach, 1992: Goodwin, 1994; Greenfield & Cocking, 1994; Hutchins, 1996; Scribner, 1984). The research reached full circle when scientific and technical learning in academic institutions was treated as an apprenticeship process (Ochs & Jacoby, 1997; Suchman & Trigg, 1996).

Investigators now conduct research with an assumption that people learn and demonstrate understanding within their natural, everyday settings (Chaiklin & Lave, 1996; Guberman & Greenfield, 1991; Rogoff & Lave, 1984). Under this paradigm, definitions of learning and intelligence encompass more environments and more ways of demonstrating knowledge (Greenfield, 1998; Sternberg & Grigorenko, 2004; Zambrano & Greenfield, 2004). Intelligence is thought of as the demonstration by the organism of succeeding in and adapting to its environment, whatever that environment may be (Scheibel, personal communication, March 15, 1996). With this definition in mind, apprenticeship has become a fruitful area of study, increasing our overall knowledge of human cognitive processes.

This chapter focuses on a particular cultural apprenticeship model, the Zinacantec model of teaching and learning, and the methods used to derive it. Our questions are two-fold: To what extent is there a single cultural model of apprenticeship that is applied to the learning of various everyday tasks and to various kinds of learners? What is the longitudinal nature of the apprenticeship model? That is, how does the model adapt to different stages of skill across time in a given learner?

The Study of the Acquisition of Zinacantec Cultural Models

The Zinacantec Maya have been the subjects of ongoing ethnographic and experimental inquiry for over 40 years (e.g., Cancian, 1992; Childs & Greenfield, 1980; Greenfield, 1973; Greenfield, Brazelton, & Childs, 1989; Greenfield & Childs, 1977; Greenfield, Maynard, & Childs, 2003; Maynard & Greenfield, 2003; Haviland, 1978; Laughlin, 1975; Vogt, 1970). It has been observed in prior ethnographic research that weaving, making tortillas, and chopping and carrying firewood are three tasks important to Maya womanhood in Highland Chiapas (Haviland, 1978; Modiano, 1973).

The transmission of weaving skill specifically has been the focus of over twenty years of empirical study (Childs & Greenfield, 1980; Greenfield, 1984; Greenfield & Childs, 1991; Greenfield, Maynard, & Childs, 2003). Girls are taught to weave by their mothers or other female relatives, or neighbors, in an informal apprenticeship. Childs and Greenfield (1980) videotaped 14 girls at different stages of learning to weave in 1970.

They analyzed the lessons, both verbal and nonverbal aspects, for the role of the learner and teacher in different parts of the weaving process. They found that the transmission of weaving skill was highly scaffolded through nonverbal communication and assistance, coordinated with verbal speech acts (Childs & Greenfield, 1980). However, there was no positive verbal reinforcement.

Findings from empirical study of the next generation of weavers in 1991 and 1993 indicate continued scaffolding and absence of positive verbal reinforcers as characteristic of the teaching and learning of weaving in Zinacantán, although there was a decline of scaffolding among families engaged in weaving commerce (Greenfield, Maynard, & Childs, 2000, 2003; Greenfield, 2004).

In terms of the Zinacantecs' procedural model of weaving apprenticeship, there has been no longitudinal inquiry into the entire process of teaching a girl to weave, from novice to independent weaving. Secondly, there has been no test of the within-culture generality of the procedural model of weaving apprenticeship to other domains of activity. In terms of the Zinacantecs' conceptual model of weaving apprenticeship, it proved impossible to elicit information concerning the Zinacantec concept of learning to weave by interviewing; the Zinacantecs would not or could not answer the questions (Greenfield, 1997b). Greenfield also tried to elicit comments about a learner's videotaped weaving session in 1970, as Tobin, Wu, and Davidson (1989) did in their study of preschools in Japan, China, and the United States. This approach also failed to elicit the Zinacantec concept, or model, of teaching and learning weaving skill; the Zinacantecs did not respond spontaneously as Tobin *et al.*'s (1990) subjects did. Most likely, it made no sense to them to be asked questions out of the context of actual activity and conversation (Devereaux, personal communication).

The present study of a single-subject teaching the entire weaving process to someone can tell us more about the Zinacantecs' procedural model of teaching and learning by elucidating more of this process from start to finish. Because the primary researcher was also the learner, her questions relevant to a conceptual model of weaving apprenticeship were "in context" and therefore answerable by her Zinacantec teacher. Finally, the ethnographic method of participant observation also lent itself to exploring the generality of apprenticeship procedures in two other important domains, making tortillas and carrying firewood.

The goal of the present chapter is to present a procedural and conceptual model of apprenticeship of the Zinacantec Maya of Southern Mexico. Deriving a model of teaching and learning in Zinacantán serves three purposes. One purpose is to have the model available as a cultural-historical account of apprenticeship of the Zinacantec Maya; it answers the question: What is teaching and learning like in Zinacantán?

The model can also be used to better answer the questions: How it is that people teach what they know? and How do people learn what they know? The exploration of teaching and learning in Zinacantán can inform research about human teaching and learning activities and processes generally.

Another purpose of formulating this model is to use the teaching-and-learning model to study cultural learning processes in Nabenchauk in further empirical studies. While several cultural psychologists have engaged in ethnographic inquiry before conducting experiments in a place, their ethnographic findings have not been published. Yet ethnography reveals a richness of findings—what Geertz (1973) calls "thick description"—that are generally lost in more controlled and structured studies.

It is important to know about Zinacantec teaching and learning styles before designing any empirical study involving learning, teaching, or even cognitive development to be conducted in this community. Ideas about the cultural place do not always fit the experimental design or the expectations of the researcher. Often a researcher will come to a new place with notions of behavior resembling and influenced by those of his or her home culture. It is crucial to the research process to do ethnographic inquiry about the models of a place before embarking on experimental work (Weisner, 1996).

This idea is further supported by Greenfield (1997a) who highlights the distinction between cross-cultural and cultural psychology. Where cross-cultural psychology makes assumptions about the features and the social world of a place, often borrowing tools from the home culture to test individuals in the study culture, cultural psychology makes no such assumptions. Cultural psychology takes the approach of inquiry, asking what is there to be studied. What is important to the people of the culture? And further, why is it important?

The present study further develops cultural psychology's methodological synthesis with anthropology. While drawing upon the anthropological method of ethnography, the present study adds from psychology a procedural awareness and explicitness about *how* the data were collected: hence, the innovation of a methods section in an ethnographic study.

ETHNOGRAPHIC METHODS IN THE STUDY OF THE ZINACANTEC MODEL OF TEACHING AND LEARNING

The current research explores the teaching and learning of three skills which virtually all Zinacantec Maya women: weaving, making tortillas, and chopping and carrying firewood. Maynard was taught to perform these tasks over a two month period in 1995 by a Zinacantec girl, Paxku'

Pavlu, who was about 13 years old at the time of the study. Paxku', a *muk'tah zeb* (big girl) and not yet considered a woman, had the skill of an adult woman in the three tasks considered for this study. All data were collected by Maynard, and the first-person-singular voice, used for clarity in the methods and results sections, represents her.

Before traveling to Mexico, I did an intensive study of the Tzotzil language in order to prepare for fieldwork. Using tapes and notebooks compiled by linguists who had done previous work in Zinacantán, I was able to learn the grammar of the language and many vocabulary words before I arrived. Immersion in the Tzotzil language made it easier to communicate, and I learned more of the language with ease in an immersion situation.

In 1995, Greenfield escorted me to the field site and introduced me to Paxku', her family, and her community. This is an important methodological point: How a researcher gets into a place influences how people respond to her. Greenfield gave me a personal introduction to many people in the community. Greenfield told them that I was interested in learning their language, learning to weave, and to learn what people do there. Because our research was in a female domain, Greenfield introduced me to other women and children in the village who seemed pleased that I wanted to learn their language and to learn to weave. A key aspect of the success of the introductions was the fact that Greenfield had begun work with Paxku's grandfather as her assistant in 1969; she had known Paxku's father and most of her uncles and aunts as children. She had met Paxku' in 1991, when she was nine years old. Even then, Paxku' had helped with the research (Greenfield, 2004). The Pavlu family also knew Greenfield's entire nuclear family and had worked with her daughter. In essence, I was accepted almost as another member of Greenfield's family. I also followed the research tradition of wearing Zinacantec clothes whenever I was in Nabenchauk.

Several times when I was introduced to someone new in the village, I was told a story of a man who was visiting years before who cried all the time because no one would talk to him and he would not eat their food. This man was not introduced by someone already accepted by the Zinacantecs and subsequently had a very difficult time working there. Thus, my personal introduction was crucial to my research experience in Zinacantán; without acceptance by members of the community, it would have been very difficult to learn about the cultural models of the Zinacantec Maya. Another aid was that the Tzotzil learning materials, developed by the Harvard Chiapas Project in the 1960s and updated by Carla Childs in 1991, included multiparty conversations that provided information about cultural routines.

Greenfield also provided other key instructions for how to be as "normal" a Zinacantec woman as a young, single, *gringa* (North American) woman could be. For example, she advised me never to go anywhere in the village unaccompanied. She told the story of a U.S. student working at the local clinic who was accused of being a witch. The evidence was that he walked around all alone, especially at night. The importance of the advice was not only for my research; it was also for Greenfield's future relationship with the community, for anything I did would reflect on Greenfield, then my academic advisor.

During two months of fieldwork in Mexico, I became a full participant-observer in the Zinacantec Maya daily routines and activities. Participant-observation is the method *par excellence* of ethnography. In this method, the researcher gets into the culture enough to learn what people do there and then actually learns the culturally important skills and, often, what people think about the skills and life in that culture, in an extended time period of becoming a participant in the culture. At the same time the researcher makes observations about what is going on and what she is doing in the activities. In order to use this method effectively, it is important to develop a clear participant role. I had one: Like Leslie Haviland (1978) before me, I was there to learn how to be a Zinacantec woman. More specifically, I wanted to learn how to pat tortillas, carry firewood, and weave, as I sharpened my Tzotzil abilities.

I used this ethnographic method of inquiry by becoming a participant-observer in the daily routines of the Zinacantec community. I lived in Southern Mexico for two months in the summer of 1995, spending part of the time in a Mexican city, San Cristóbal de las Casas, and the majority of the time in Nabenchauk, a Zinacantec Maya village. I traveled to the village for three or four days at a time, spending the days and nights with a family there. The family of eight lived in a one-room house with no sanitary plumbing. I paid the family a nominal amount for letting me stay in their home and for food each day. They were very generous in their hospitality.

On a typical day, I arose with the family or shortly after and began the day by talking with them. A few days into my stay, Paxku' asked if I wanted to learn to make tortillas and I said that I did. From then on, part of their daily routine was rising with the chickens around 6 in the morning and making tortillas for the family together, as Paxku' taught me how to do it. Paxku' also taught me to weave and to chop and carry firewood. She taught me to weave in eight sessions ranging from 2–5 hours each. I paid her a small amount for teaching me to weave. Paxku' invited me to come along on three trips to gather firewood and showed me how to chop and carry the wood home in a tumpline. I was accepted by the family as a participating member, learning how to do things around the house.

At the same time that I was learning how to carry out Zinacantec daily activities, I almost always had a notebook with me and wrote down everything I possibly could about what people said and did. While people noticed that I was writing things down and often joked about me and my *vun* (paper), the notebooks did not seem to interfere with participation in the daily routines. The Zinacantecs are accustomed to researchers coming to visit and carrying paper around with them and writing things down. The adults did not seem to mind the notebooks. Children were very interested in what I wrote down and often asked me to read it aloud to them. I spent many afternoons reading English, Spanish, and Tzotzil field notes to children who loved hearing aloud observations, conversations, and songs I had recorded.

It was very important that I used a notebook to record my observations, as opposed to a video camera or a tape recorder. Having a video camera would likely have caused Paxku' to set up the teaching space wherever the camera was. With the notebooks, I could go wherever Paxku' told me to go: inside the house, the front porch or courtyard, or the backyard. I could not have taken a video camera to gather firewood. A video camera would have severely interfered with the natural process of teaching and learning I was attempting to capture. An audio recorder would not have been of much use because there was not a lot of verbalization in the teaching and learning processes to record, as will be discussed in analyzing and presenting the model.

The Use of Questions in Ethnographic Research

One issue that arose in the collection of the data is the use of questions to gain information in Zinacantán. I went to Nabenchauk full of questions to ask about life there. I soon found, however, that inquisitiveness was not welcome socially, and that providing too much information about myself was also a bad idea. I was often frustrated when Paxku' did not answer my questions. I thought perhaps I was not asking the right question, or that I was asking the questions in the wrong way. An observation of cultural activity helps to explain this quandary: Zinacantec children are often observers of the conversations of the adults around them. Paxku' was probably not accustomed to having someone's undivided attention, and especially being asked questions by that person.

Paxku' was apparently unaccustomed to being asked "How?" and "Why?" questions. She often did not answer when I asked her such questions. I could not get at conceptual knowledge in an interview that was out of the context of weaving. Providing or using a concrete context for the "Why?" questions resulted in more answers from Paxku'. When I asked Paxku' "Why?" questions while we were weaving, which provided

a concrete context, Paxku' could provide an explanation. The following excerpt from my field data illustrates this point.

> I said, "Why is it difficult?" She said because it is so wide and pointed to how wide the piece of cloth is. After she had finished making the heddle she then started to make a few lines. She told me to watch her. I asked her why she was weaving it and not me and she said because it was difficult." (September 12, 1995)

Organizing the Fieldnotes

The data from which the model is derived are taken from my extensive fieldnotes. The fieldnotes include data of two types: direct quotes from Paxku' and her mother about the activities we were doing, either while we were doing the activity or after, and my thoughts about and observations of what we were doing. For the present analyses, we took the subset of the total collection that was about weaving, making tortillas, and carrying firewood.

These data fit into a framework of procedural and conceptual knowledge (Hatano & Inagaki, 1986), where procedural knowledge is characterized by "knowing how" and conceptual knowledge is characterized by "knowing that." Procedural knowledge is knowledge of *how to do* a task, the different actions required to do components of the task and ultimately the entire task. Conceptual knowledge is knowledge *about* the task, what one thinks about the task or knowledge overall of the task. Paxku' demonstrated her procedural knowledge with the actions she used when she taught me to do the various things. My field notes reflect Paxku's procedural knowledge as recordings of how she taught me. Paxku' demonstrated her conceptual knowledge when she spoke about weaving, making tortillas, and carrying firewood, or about teaching and learning generally. Paxku' also demonstrated conceptual knowledge of teaching and learning in what she said about the teaching and learning of weaving or the other tasks. This conceptual knowledge was communicated by specific verbalized examples of a concept, not by a generalization itself, as Paxku' did not make generalizations of the teaching-learning process. The fieldnotes also included my conceptual analyses of the teaching-learning process.

There were data that were about actual lessons I had in the three tasks in question: 8 weaving sessions, 10 tortilla sessions, 3 firewood sessions. There were also notes from conversations that occurred outside the context of the teaching-learning sessions. The subset of the fieldnotes regarding teaching and learning were entered verbatim into a word processing program and then qualitatively analyzed with computer software macros written for this purpose. With the help of an expert in qualitative data analysis, Gery Ryan, I created macros in Microsoft Word that I used in coding

the data. Coding proceeded as I read through the fieldnotes and inserted codes that represented the levels and themes of interest in the study. For example, at one level there was the issue of the activity we were doing, such as "chopping wood, day 1." Another level had to do with the kinds of materials used, such as "yarn," and yet another level had to do with the discourse used in the instruction, such as "imperatives."

In this chapter we intend to model Zinacantec Maya teaching and learning, not the tasks from which the model is derived. The model of teaching and learning derived here is presumed to be a "shared, recognized, and transmitted internal representation" (D'Andrade, 1992, p. 230). Indeed, it is because this model is not explicitly represented in the culture that this research is undertaken. Further, it is important to do ethnographic research to find out what is important to the members in order to better understand their cultural models. Underlying features of the cultural model generate specific manifestations in practice. These specific manifestations form a pattern in the ethnographic observations.

We had initially intended to use only the weaving sessions to derive a model of teaching and learning of weaving. However, in reviewing the fieldnotes, there was an obvious general pattern in the way Paxku' taught the three activities: instruction was always scaffolded and learning always occurred through guided participation (Rogoff, 1990). In presenting the model we will focus on the training of weaving skill and discuss the training of making tortillas and gathering firewood as support for the teaching-learning model, drawing on the general pattern in the teaching behaviors across the three tasks.

Features important to the psychology of the model, in italics, are organized around the procedural-conceptual distinction.

THE ZINACANTEC MODEL OF TEACHING AND LEARNING: PROCEDURAL FEATURES

The procedural features are divided into two categories: those that involve scaffolding and those that do not. There are five sub-features related to scaffolding in the model.

Scaffolding in the Transmission of Cultural Skills

Scaffolding is a term used to describe the help provided to learners such that they will be able to perform a task, because of the help, that they cannot yet perform on their own. Scaffolding in all areas of highland Maya education has been highlighted in past research (Childs & Greenfield, 1980;

Greenfield, 1984; Modiano, 1973). Another important feature of the scaffold is that it should be developmentally sensitive: help can be gradually withdrawn as it is no longer needed. A second feature of the scaffold is that it can be sensitive to task difficulty: more help can be given on harder parts of the process (Childs & Greenfield, 1980; Greenfield, 1984).

Prior Work on Weaving Apprenticeship in Nabenchauk

Prior work on the teaching of weaving skill by Greenfield and Childs (1991; Childs & Greenfield, 1980; Greenfield, 1984) has indicated that the teaching of weaving skill is highly scaffolded, involving close contact between teacher and learner. One aspect of the scaffolding process was that the teacher would show the learner how to do various parts of the weaving process before letting her do them alone; almost invariably, the learner watched attentively (Childs & Greenfield, 1980). The importance of observational learning has been noted also by Jean Lave, who studied Vai and Gola tailors as their apprentices learned the trade in Africa (Lave & Wenger, 1991).

A second component of scaffolding occurred when the teacher worked cooperatively with the learner to help her with parts of the process that the learner could not do alone. Less help was provided for the more experienced learners and none at all was provided for the expert teenage weavers. The teachers also provided learners with more help on harder parts of the weaving process (e.g., getting started with weaving the first weft thread) and less help on the easier parts (e.g., weaving a later weft thread).

There was also more verbal guidance—in the form of imperatives—for the less experienced weavers and the harder parts of the process, less verbal guidance—in the form of statements—for the more experienced weavers and the easier part of the process. The predominance of imperatives early in the process signified a teacher-directed process and respect for the teacher's authority (Greenfield, 2004).

Multimodal interactions (speech plus action or gesture) predominated in teacher-initiated interactions for girls who had never woven before (68% of all teacher-initiated interactions were multimodal). Multimodal interactions declined with more experienced learners, for example, constituting only 33.6% of interactions for girls who had previously woven between two and four items. Help in the form of a single modality (action, gesture, or speech) is less redundant; redundancy is useful at the beginning of a learning process. In all of these ways, the scaffold was adjusted to the skill level of the learner and the difficulty of a particular task component (Childs & Greenfield, 1980).

Apprenticeship models of cognition have chronicled the ways in which people, especially children, learn to do things by participating in

the activities themselves (Lave, 1988; Lave & Wenger, 1991; Rogoff, 1990; Rogoff & Lave, 1984). Based on our systematic video study of Zinacantec girls learning to weave in Nabenchauk, as well as these studies in other communities, we hypothesized that the instruction of all three tasks, weaving, making tortillas, and carrying firewood, would be scaffolded and acquired through practice. There are two features of the model that comprised the ethnographic findings about scaffolding in teaching and learning in Zinacantán. Both are consistent with the findings of Greenfield of Childs on Zinacantec girls learning to weave in 1970: 1) that the teacher pays attention to the learner and provide decreasing assistance as the learner improves, adjusting to the learner's ability; and 2) that the teacher will make choices for the learner about which parts to do on a certain day, rather than the learner choosing what to do. These, as well as the other findings, were generated inductively, out of the data themselves.

Scaffolding Features in the Zinacantec Model

Feature 1: The Teacher Pays Attention to What the Learner is Doing, More When She Doesn't Know and Less When She Knows More, Providing Less and Less Help As the Learner's Skill Improves

Paxku' gave me less and less help as the lessons progressed. Paxku' always provided the environment and the setup for weaving (the loom, the thread, etc.). She decreased the amount of help as I became more skilled. In the first lesson, Paxku' did almost all of the work. I was able to do only what a three- to five-year-old girl could do, as evidenced in the study of weaving apprenticeship by Maynard and colleagues (Maynard, Greenfield, & Childs, 1999). I mostly watched what Paxku' was doing and tried to learn. In the second lesson, I watched less, and Paxku' had to help with the most difficult parts and with keeping the weaving going. In the third lesson, Paxku' left me for several short periods, and I was able to keep the weaving going on my own. Paxku' came to check and knew when to intervene. This pattern was in line with the decline in observing the teacher as learner skill increases found for Zinacantec weaving learners (Childs & Greenfield, 1980).

By the end of the fourth lesson, I was weaving well on my own, needing only occasional help from Paxku' once the weaving process had started. I could pass the bobbin through on my own, but still needed Paxku' to help set up the loom, assist in the most difficult part of the weaving: finishing a piece once the threads were very tight in the warp and tying the piece off and take it off the loom. This trend toward more independent weaving ended when I attempted weaving a very large, more difficult piece for my skill level, as evidenced in the following passage:

> "I sat down and tried to make a few lines. I had to ask Paxku' to come over and help me lift the heddle... I was unable to weave more than a few lines and asked Paxku' to finish the piece for me."

In the course of two months, I went from novice to independent weaving, though I still needed more practice to become an expert. The scaffolding Paxku' employed in teaching me to weave is a longitudinal demonstration of what Childs and Greenfield (1980) demonstrated cross-sectionally.

Another aspect of scaffolding observed with Zinacantec weaving learners was that the teachers adjusted the quantity and nature of the instruction to task difficulty: teachers intervened more on the harder parts and less on the easier parts (Childs & Greenfield, 1980). Paxku' coordinated this feature of scaffolding with my developmental progression of weaving skill. Thus, Paxku' provided me with easier parts of each process to do first, eventually giving more difficult parts for me to do on my own.

At the beginning of the third weaving lesson, Paxku' wanted to know whether I wanted to learn the most difficult part of weaving, tapestry brocade. I asked if it was possible to learn and Paxku' thought that it was. I indicated interest and Paxku' said, "Not yet." I never progressed to that expert level of weaving. Paxku' never mentioned the possibility again, after seeing what I could do in the lessons. Paxku' provided only what she thought I needed to know, giving more and more information as I improved in subsequent lessons.

Feature 2: The Teacher Makes Choices for the Learner About Which Parts to Teach First, Which Parts of the Process to Include in Succeeding Lessons, and in the Case of Weaving, Which Colors to Use

In all three tasks, Paxku' made all the decisions about what parts to give or to teach me on a given day. She did not ask me what I wanted to do, nor did she ask when I was ready to try something new. This reflects a collectivist value of respect for superior knowledge versus the individualist value of personal choice (Markus & Kitayama, 1991). This value had been manifest in the high rate of imperatives used by teachers to guide beginning Zinacantec weaving learners (Childs & Greenfield, 1980).

Paxku' made all the decisions about what she and I would weave, the colors to use, and how the winding would be set up. We had several conflicts about these issues. For instance, I would want to wind the thread one way and Paxku' would insist on a simpler way, more appropriate for my overall skill level in weaving.

I was often frustrated that Paxku' decided herself on what we were going to do during a lesson before I could even say what I wanted to do. These conflicts illustrate a cultural difference between me and Paxku':

Paxku' believed that she as the teacher could choose for me, and I wanted to choose for myself. One area in which we had our biggest conflicts was in choosing and assigning colors for a piece.

> "I was so excited about going back to the store to pick out colors . . . Paxku' was picking out colors for me. I started to pick out colors the way Paxku' groups them together. She was hanging near me to check what I was doing. She had the colors she thought were right . . . She did not like my colors. She took some of them away and put them back and showed me what colors were right and good . . . This was a major conflict for us. I wanted to pick out colors that I liked and she had this other idea about it. She told me that it needs to be dark and light, dark and light . . ."

Paxku' structured all the lessons by setting up the activity and guiding me through it, eventually leaving me to do things on my own. This was clearly a cross-cultural value conflict between my more individualistic mode, valuing choice, and Paxku's more collectivistic mode, valuing the master's authority, based on a superior level of skill.

Another example of scaffolding is breaking down a complex task into simpler parts. I asked Paxku' one day, "Why are we winding on the *komen* today when before we were doing it on the loom?" She said, "You learn this way." This implies the idea that there are prerequisites in the stages of weaving. In another conversation about winding Paxku' said that winding on the loom was easier. Actually, winding on the loom is cognitively simpler, though it is manually more complex. Paxku' seemed to have some implicit knowledge that something that is cognitively easier should be learned first. She wanted me to learn how to wind on the loom, which is how the Zinacantecs start to weave.

Feature 3: Talk during the Lessons that Involve the Tasks should Accompany a Demonstration of the Action being Explained

Paxku' never taught me to weave in a solely verbal way. She did not speak much during the lessons, but when she did speak, it was in concert with the action she was describing. One possible explanation is that Paxku' did not verbally delineate the steps of the weaving process because I was not yet fluent in Tzotzil at that time. If it were true that Paxku' was aware of my developing language skills, then we would expect her to give more nonverbal instruction when I was first learning the language and weaving, and more verbal instruction as my facility with the language increased. It was interesting that Paxku' did not, however, increase the use of language in her teaching as the sessions progressed, even though my Tzotzil improved significantly. The more likely explanation is that the Zinacantecs use language to illustrate a process of weaving only when they are doing the task, and that linguistic instruction is not inherent in their

culture. The study of Zinacantec weaving learners found that language is generally used deictically in conjunction with gestures or the action it is describing, particularly at the early stages of learning (Childs & Greenfield, 1980).

Feature 4: Observation is the First Step in Learning

Paxku' asked me to observe each step of the weaving process before she taught me how to do it. She told me to sit and watch her, later giving me the opportunity to do it myself. Observation could be considered the first step in the scaffolding of learning.

Feature 5: If the Learner Needs Guidance in How to Use Her Body in Weaving, it is Necessary to Touch the Learner to Direct Her Body in the Proper Movements

The model of teaching and learning was flexible to accommodate me as a non-native learner. Paxku' helped by directing my body during the weaving process, something she would not have had to do with a more mature Zinacantec learner (Maynard, et al., 1999). This is implicit in my weaving sessions. Paxku' touched me whenever I did not lean back far enough, or forward enough, or when I needed to kneel instead of sitting more cross-legged. Paxku' tried to direct my body so that I could weave in the proper Zinacantec way and "make the weaving easier" (Paxku', September 12, 1996). I was not, however, skilled in the bodily processes necessary for weaving (Maynard, et al., 1999), and I needed much guidance in this area.

This is one area where I differed from the native learners, most of whom did not need instruction in what to do with their bodies. A screening of a videotape of the oldest novice weaving-learner (15 years old) among the subjects studied by Greenfield and Childs (1991) showed no instruction in bodily technique. Although the learner is not as elegant as the younger weavers in the study, no one tells her what to do with her body. However, note that, although the actions differ, the principle is the same: scaffold the learner in whatever way is needed.

Other Procedural Aspects of the Model: Generality of the Model across Task Domains

Feature 6: Girls Begin to Learn the Three Tasks When They Are about Age Five, Though the Tasks Differ in the Age at which a Girl is Expected to Perform Them on Her Own

It is known from other research that Maya girls in Highland Chiapas typically begin to do some part of weaving, making tortillas, and carrying

firewood at age four or five (Modiano, 1973). For instance, at age five a girl might begin to weave a very small piece of cloth on a play loom or she might learn to spindle wool yarn. A girl might be expected to make tortillas as early as age five, though she will not turn them over on the *cemete* (griddle) until about age nine or ten. Small children are expected to carry one piece of firewood beginning at about age five.

The age at which a girl is expected to perform by herself the tasks of weaving, making tortillas, and carrying firewood varies by the task. Paxku' said that girls learned to weave at age seven, that they learn to make tortillas by themselves at about age nine, and that they begin to carry a little bit of firewood when they are about five years old, carrying more firewood when they are bigger, about age nine. She also told me that these are the ages at which she was doing these things on her own, and she may have generalized from herself to other girls in Nabenchauk.

Feature 7: Continuity Across Tasks: Procedural Knowledge of Instruction in Making Tortillas and Gathering Firewood

The procedural features of the model for weaving instruction are continuous across the tasks of learning to make tortillas and learning to chop and carry firewood. Observation is important in all three tasks. Paxku' told me to watch her in the earliest lessons for each of the tasks. I would sit with Paxku' and watch while Paxku' did the activities. This was how Paxku' expected me to learn. This emphasis on observational learning is best exemplified by a quote from Marta Turok, a U.S. college student learning to weave from a Maya teacher in Chiapas. She says:

> Many times she [the teacher] would verbally call my attention to an obscure technical pint, or when she would finish a certain step she would say, "You have seen me do it. Now you have learned." I wanted to shout back, "No, I haven't! Because I have not tried it myself." However, it was she who decided when I was ready to touch the loom, and my initial clumsiness brought about comments such as "*Cabeza de pollo*! (chicken head) You have not watched me! You have not learned!" (Turok, 1972, pp. 1–2).

Like Marta Turok, I was expected to observe first, and to do so in all three of the tasks before doing them myself. For example, when we went to gather firewood the first time, Paxku' taught me to sit down and watch her and another girl chop the wood. Observation was stressed in making tortillas, also, when Paxku' told me to watch her do something and then later allowed me to try it.

Paxku' paid very close attention to what I did in each task as she taught me. Even when I performed the tasks more independently, Paxku' was quick to tell me when I did not press a tortilla correctly or

how I could chop the wood better. Interestingly, applied research in Los Angeles showed that, in a manner similar to Paxku's, Latino immigrants come to the United States with an orientation toward a teaching style that points out errors to be corrected, rather than with a teaching style that tries above all to preserve self-esteem (Greenfield, Quiroz, & Raeff, 2000).

Paxku' always adjusted the instruction to my level of learning in each of the three domains. The lessons in weaving progressed the most slowly, followed by making tortillas, and, lastly, chopping wood. I had never woven nor made tortillas before, though I had chopped wood, but never directly from trees. Paxku' taught me to do each of these tasks in her way and she adjusted the lessons according to my performance. It took me much less time to chop wood independently to Paxku's satisfaction than it did to make tortillas or weave independently. This could be related to my prior experience with chopping wood, or to the lack of precision required by that task compared with making tortillas and weaving.

Paxku' also made choices for me on what I would learn first and what I was allowed to do in making tortillas and carrying firewood. She would direct me and decide what I was ready to do next. When I was learning to make tortillas, Paxku' decided that I would first learn to press a tortilla, and she put it on the fire for me. Later Paxku' allowed me to press the tortilla dough and then put it on the fire myself. Next, Paxku' gave me bowls of tortilla dough which I pressed and placed on the fire. Still later, Paxku' gave me a bowl of dough for me to shape into dough balls, followed by the sequence of cooking them on the griddle. Finally, Paxku' instructed me in how to prepare the ground corn meal from dried corn to be used for cooking.

Paxku' also made all the decisions about what I would do when we were gathering wood. On our first gathering excursion, Paxku' told me to watch, and allowed me to carry wood home. On the second occasion, she allowed me to chop wood from a small tree that she had already chopped down. That day, I was allowed to carry the wood home. During the third lesson, Paxku' again showed me how to cut down a small tree, to chop it into smaller pieces, and to carry it home.

There was relatively little talk in each of the tasks. When Paxku' did speak she always accompanied her words with the action she was describing. For example, she would place a ball of tortilla dough on the press, close the press, press down and say, "Like this." In chopping wood, she would chop and say, "Like this." There was no decontextualized language about making tortillas or carrying firewood, with the exception of occasions when Paxku' told her grandfather or other visitors that she was teaching me to do those things.

CONCEPTUAL FEATURES OF THE ZINACANTEC MODEL OF TEACHING AND LEARNING

The conceptual features are divided into two categories: beliefs about teachers and beliefs about learners.

Beliefs about Teachers

Feature 8: The Teacher must Know How to Do the Complete Task Herself

This was made explicit with regard to weaving in a conversation with Paxku's mother, Maruch. "Paxku' told me that she can teach me to weave. I asked Maruch if Paxku' could help me learn to weave. She said, "Yes, she knows well already." (August 16, 1995).

This fact is also implicit in the data. Paxku' never asked her mother for assistance in teaching me to do any of the tasks. Paxku' knew how to do the task, could do the task alone, and was always my only teacher in the three tasks. Although her mother or other people were often nearby when we were doing an activity, they did not give Paxku' instruction in how to instruct me, nor did they tell Paxku' how to do the task differently.

Feature 9: Teaching Style is not Based on the Learner's Age but on Her Experience with a Task

There are normal or expected ages at which a Zinacantec girl will be expected to begin to weave and to be able to weave on her own. Weaving instruction usually begins with a pre-weaving stage, play weaving, at age four or five (Greenfield, 1995), and can include weaving on a toy loom, or performing a small part of the entire process, such as spinning wool thread on a spindle (Modiano, 1973). By age seven, many girls are able to weave a large piece of cloth on their own, with little assistance from teachers (Greenfield & Childs, 1991).

Paxku' knew that I was already an adult at the time of the study. In Zinacantec culture, almost all adult women would be expert weavers. Exceptions would be a few girls and women who had to work for wages and therefore did not weave clothing for the family as their work.

Paxku' taught me to weave according to my experience and actual ability, not according to my age. As a non-native learner, I was given much more instruction in weaving skill than the oldest first-time weaver, another girl named Paxku', a 15-year-old studied by Greenfield and Childs (Maynard, Greenfield, & Childs, 1999). This teenage Paxku', although she had never woven, was quite skilled in the process having seen it performed her entire life. She also reported doing play weaving when she was a little

girl, an important source of learning (Greenfield, 2000, 2004). She did not require much assistance to keep the process going, once the loom had been set up. In contrast, my teacher, Paxku', was sensitive to my ability level and she stayed close to me to help when needed, leaving me to work more independently as my skill improved. She did not have an expectation that I should be able to weave as an adult, but tailored her instruction to my experience.

Beliefs about Learners

This part of the model of teaching and learning focuses on the implicit, and sometimes explicit, beliefs of the teacher about the learner. This is also part of the scaffolding in the model; the teacher gives the learner opportunities to perform tasks at her ability level. What the teacher knows about the learner affects how the teacher will construct the lessons. There are other features of the learner that affect the teaching; these are also part of the model.

Feature 10: The Learner will be Able to Progress Form Novice to Independent Activity

The Zinacantec Maya model of teaching and learning has a goal, to train the learner to eventually be able to do the task herself. Paxku' made this an explicit goal in two of the three tasks, weaving and making tortillas, toward the end of the training. She told me that I should buy the weaving tools to take home to the United States in order to weave at home, but where there would be no instructors. In making tortillas, she said, "Now you have learned and you can make tortillas at home." In carrying firewood, it was clear that Paxku' wanted me to chop and carry wood on my own, and I was eventually able to chop and carry firewood as a Zinacantec woman would, with little help. The model incorporates this goal of eventual independence in the procedural features above. The goal that I would eventually be able to do the tasks myself was evident in all of the tasks. After I could make tortillas independently, Paxku' told me on several occasions that I should buy a press to make tortillas at home. She also suggested that I buy a tumpline and a machete to be able to chop and carry wood at home in my land.

Feature 11: Schooling does not Play a Role in Learning to Weave (Those Who have not been to School can Learn to Weave and Those Who have been to School will not be Aided by that Experience in Learning to Weave)

One cannot learn to weave by going to school. Weaving is not taught in the schools. Girls learn to weave at home with their mothers, aunts,

grandmothers, cousins, sisters, or neighbors. Paxku' had never been to school and was an experienced weaver. She learned to weave at home. I asked Paxku' if it was possible for her younger sister, Rosy, who was attending school, to learn to weave there.

AEM: Is it possible for Rosy to learn to weave in school?
PAXKU': No.
AEM: Why is it not possible?
PAXKU': (no answer)
AEM: How will Rosy learn to weave?
PAXKU': At home.

Paxku' clearly knew that Rosy would learn to weave at home. She did not answer my question of why Rosy will not learn to weave in school.

There are at least two possible explanations for this. First, she might think that people don't weave in school but she has never been to school herself, so she may not have been certain. However, she did know quite a bit about school from her younger siblings who had gone to school. Paxku' knew that one uses paper and pencil in school. She knew that the children learn songs and games in school. It is likely that Paxku' knows from her siblings who have been to school that there is no weaving in school.

Another explanation for Paxku's reticence when I asked her "Why?" questions is that she was not accustomed to being asked those kinds of questions. In fact when I asked her "Why?" questions without a concrete context, Paxku' did not answer. In an early conversation, I asked Paxku' if it was possible for anybody to learn to weave in school, to which Paxku' answered, "No." I then asked how people learned to weave and Paxku' replied, "They learn from people."

This example of a "Why?" question is abstract and not grounded in immediate experience. Paxku' could have responded that they just don't teach weaving in school. She may have thought that I was asking her why weaving is not taught in school, to which one probable answer is, "Because people do other things there." Paxku' knew that one learns to use paper in school and one learns to weave at home. The issue of asking questions will be further explored in a later section.

Paxku' did not seem to think that going to school changes the way one learns to weave. She knew that I was a student, that my work was going to school, but Paxku' never asked me how many years I had been in school or what I did there. Paxku' may have had some ideas about me as someone who had been to school. We do not know how my occupation as a student influenced Paxku's behavior. We do know that Paxku' taught me to weave as a Zinacantec would be taught, scaffolding the process and giving little verbal instruction.

Feature 12: Schooling can Give one the Ability to Use Paper, in the Pattern Books, to Weave

The Zinacantecs know that going to school can affect one's ability to use paper to weave, although school does not affect one's ability to learn to weave. Pattern books for embroidery are found in some homes in the village, and some of the girls and women use them to weave. The Tzotzil word for school is *chanvun*, literally, "learn paper." One Zinacantec woman said, "to look at paper [use patterns] you have to learn paper" (Greenfield, 1999).

Feature 13: One cannot Learn to Weave from Looking at or Using Paper

The embroidery patterns used for weaving by some girls and women in Nabenchauk must be mentally transformed from a one-to-one correspondence with each square in the cross-stitch pattern, to a one-to-three or four correspondence in the weft dimension to make the pattern appear the same way once woven into a piece of cloth (Greenfield, 2000). I asked Paxku', "Is it possible to learn with paper?" and Paxku' answered, "No." I asked her why and she said, "It's not possible to learn that way." (August 23, 1995). In fact, it was not possible to learn basic weaving from pattern books; they were relevant only to brocade weaving. Indeed, in Paxku's generation, 64% of the 45 learners interviewed said they had learned basic weaving from their mothers (Greenfield, 2004); not one mentioned leaning from "paper." However, even for brocade weaving, only 13% of weaving learners mentioned learning the technique from paper. The dominant response when asked how they learned was "by myself" (49% of 39 girls) (Greenfield, 2004).

Feature 14: The Learner is Ready to Move up to Something New When She "Knows"

Characteristics of the learner influenced the scaffolding process in the weaving lessons and are part of the model of teaching and learning. Paxku' gave new tasks to do when I showed that I could do an old task on my own. In a sense, this is the personal part of scaffolding; it is intrinsic to it.

The following excerpt is an example from a weaving lesson of Paxku' telling me that I was doing something because I "knew." However, the Maya concept of "knowing" requires the knowledge to have become habitual and be part of the knower's character or personality (Zambrano & Greenfield, 2004); the criteria for knowing are usually more stringent than for the English word "know."

The example is about winding the thread to be woven. Thread for weaving can be wound in two ways, on the *komen*, a large device with notches used to select the desired length of cloth, or on the loom itself. Winding on the loom itself requires setting up a "toy loom" (Maynard &

Greenfield, 2003). The toy loom is a part of a pre-weaving stage of weaving, performed common in Nabenchauk. Girls proceed from winding on the loom to winding on the *komen*. Toward the end of the weaving lessons, when I was able to keep the weaving going on my own, Paxku' decided we would use the *komen* to wind the thread. I asked Paxku' why they were winding on the *komen* when before they were winding on the loom. Paxku' replied, "You know well already." Paxku's aunt, Mal, came out of the house to see what they were doing and suggested that I weave a tortilla bag. She brought an example of such a bag. I asked Paxku' if it was possible and she said yes. We went to the store to buy more colors to make the tortilla bag and then returned to unwind the piece we had already started. After winding the large piece on the *komen*, Paxku' decided we should wind the smaller piece on the loom, and we had the following conversation.

AEM: Why are we winding this on the loom now when before we were winding on the *komen*?
PAXKU': For the tortilla bag, it is longer, so we use the *komen*. For the little one, now, we do it this way.
AEM: But why did we use the *komen* for the striped bag?
PAXKU': Because now you know.

There are several other instances of Paxku' saying that I could do some part of the process because "Now you know."

Feature 15: Bodily Experience and Skill Play a Role in Weaving

As part of the loom, the body is central to the weaving process. Knowing how to properly use one's body to weave is crucial to successful weaving (Maynard et al., 1999). Paxku' was aware that I would weave better if I had better bodily skills and she tried to explain that many times while I was attempting to weave. She often had to tell me what to do with her body when she was weaving and she would direct her as to what to do, touching my body and helping me.

Feature 16: Continuity Across Tasks: Conceptual Knowledge of Instruction of Making Tortillas and Gathering Firewood

Though most of the conceptual features of this model reflect the teaching and learning of weaving skill, there was continuity in several conceptual features across the tasks of making tortillas and chopping and carrying firewood. For example, bodily skills such as strength and balance that were so important in weaving (Feature 15) were also important in carrying firewood and in kneeling while pressing tortillas. Features 10, 11, and 14 are also relevant to conceptions of the learner in the acquisition of the other skills.

DISCUSSION

The psychological reality of a person is the world as he or she experiences it, through interaction with it, filtered through his or her own expectations, biases, and mental models. We have attempted to construct a psychologically real model of Zinacantec teaching and learning. By "psychologically real" we mean that the model is a description of Zinacantec teaching processes, which reproduces in an observer the world of meanings of the native users of that culture. The model has been validated in a number of crucial respects by its correspondence to the strategies used by Zinacantecs to teach weaving to other members of their families and by what they say about this process in an interview situation.

In the present ethnographic study, we generalized the model from weaving to two other tasks that are central to women's work: making tortillas, and carrying firewood. We hypothesize that it is a general model of the teaching-learning process of the Zinacantecs. Indeed a major potential implication of this study is that a given group may have a generalized model for cultural apprenticeship. A contrasting case in which pedagogical methods have been studied in different domains would be interesting in this respect.

The model is in agreement with some particular findings elsewhere in the Maya world. For example, it reflects the specific model used to teach and learn tortilla making in a Maya community in Guatemala (Rogoff, 1990). At least one aspect of the model—the importance of following commands—has also been described for Maya children's contributions to their households in the Yucatan (Gaskins, 2003). Finally, the model reflects the general process of Maya teaching and learning described by Arias Sojob (1970, cited in Modiano, 1973):

> Education means to be conscious of the world where fate has placed him and shaped all the possibilities of his life. There is also a connotation of "becoming accustomed" in this concept of education, somewhat akin to the North American concept of training as opposed to problem solving. A situation is repeated as many times as necessary, until the child becomes accustomed and is able to perform as expected . . . Learning, then, is intimately tied to the environment, to the community, and to the daily round of activities. Children learn as they participate in the religious, economic, and social life of the community, contributing their share to the family's welfare. They learn to farm by farming, to weave by weaving, to communicate with the supernaturals by communicating.

The process by which Zinacantec children are educated in important cultural knowledge stayed largely the same through the twenty-five years between our first study of weaving apprenticeship in 1970 and Maynard's

experience in learning to weave in 1995: they learn to do something by doing it. Maynard learned to perform the Zinacantec tasks of weaving, making tortillas, and carrying firewood by doing them in an apprenticeship process, with help and guidance from a teacher.

The teaching of weaving, cooking, and carrying firewood is part of the education of Zinacantec females. We have constructed a model to build a generalized description of the teaching and learning of these activities. Thus far, we have evaluated it by comparing the model to the empirical findings of Greenfield and Childs (Childs & Greenfield, 1980; Greenfield, 1984, 1999, 2004; Greenfield & Childs, 1991; Greenfield, Maynard, & Childs, 2000, 2003). As we have seen, there are many parallels between the ethnographic data presented here and their cross-sectional database of 72 weavers from two historical periods. For instance, in both sets of data there is scaffolding. In both sets of data, verbalization to beginners consists mainly of commands and is tightly coordinated with action and gesture. We also have independent evidence in our experimental data of the importance of observational learning in acquiring weaving skill (Maynard & Greenfield, 2003). The way in which Paxku' taught Maynard to weave from start to finish reflects the same strategies used by teachers in the Childs and Greenfield (1980) database who were teaching girls of different stages of acquisition. However, Maynard's teacher was able to adapt her strategies to specific differences in Maynard as a learner, compared with Zinacantec girls. For example, she provided more help and guidance concerning the use of her body because she did not have the culturally "trained" body of a Zinacantec learner (Maynard et al., 1999). In this way, she generalized the strategy of a scaffold—providing whatever help the learner needs at her particular stage of development—to a new situation. Her particular moves or behaviors were different because her pupil's bodily knowledge was different from an indigenous learner—but, at the more abstract level, what remained constant was the higher level scaffolding strategy. All indications are that the Zinacantecs generalize their model to different activities and to different kinds of learners, both indigenous and foreign. We therefore predict that it would apply to Zinacantec boys and male tasks as well.

While it might be valuable to do a longitudinal study of one Zinacantec teaching another Zinacantec how to weave, there is a benefit of this longitudinal study involving a non-native learner. To extend the analogy that a cultural model is like the grammar of a language, exposure to another language makes the grammar of one's native language more obvious. For Maynard as an investigator, learning how to do things in Zinacantán made Paxku's cultural models and her own cultural models stand out in relief. Pitted against each other each of their cultural models of teaching

and learning became quite obvious. For example, Maynard's model of personal choice in selecting colors for weaving a piece of cloth did not fit with Paxku's model of the teacher choosing for the student.

This model of teaching and learning, the Zinacantec model, is only one of many possible models people in various cultural places use to transmit culture. The model is instantiated in Zinacantec culture and activities, activities influenced by ecocultural features of the place. For example, the general cultural value of obedience to the weaving teacher as authority was instantiated in the apprenticeship process. Although Maynard was Paxku's "boss," in that she paid her for her work, Paxku' was the clear authority on Zinacantec culture, and she expected Maynard to conform to her suggestions. For the Zinacantecs, the cultural education of an individual is a long-term, ongoing process which involves a great deal of teacher attention and teacher-learner interaction at the beginning of the learning process, with decreasing interaction until the learner can perform the task alone. For the weaver to know weaving, the practice must become habitual (Zambrano & Greenfield, 2004).

Other models for learning might look very different. For example, one might imagine a teacher giving her pupil an outline of the entire task before starting to do any one part of a task. A weaving teacher might say, "First we will wind the thread. Then we will make a heddle. Next we will make a bobbin. And then we will finally start to weave," explaining in detail what it means to do each of those steps. Paxku', however, did not explain the tasks she taught Maynard to perform. She just started teaching the tasks in practice, giving some part or another to do. On the other hand, learning might also be more trial-and-error, as in the backstrap loom weaving class observed by Greenfield (Greenfield & Lave, 1982).

One purpose of deriving the model is to have available the kind of ethnographic information which can and should inform any experimental investigation of the same domain in Nabenchauk. More generally, future researchers who wish to study in a particular culture can use ethnographic findings. Further study might also be ethnographic, but might include more subjects, measurement of behaviors or variables in question, and testing the model for its psychological validity with informants. Or, further research might include an experimental paradigm in which the researcher desires to study how the Zinacantec Maya learn a new task. If a researcher wants to explore how it is that Zinacantec Maya people perform a task that involves learning something new, such as a spatial learning task, then this model can be used as a basis for the design of such an investigation. For example, a researcher might combine knowledge about spatial ability and the acquisition of spatial skills with this model of teaching and learning in Nabenchauk to conduct a study involving the education

of spatial skills in Nabenchauk, or to use an experimental paradigm that involves teaching and testing a group on spatial ability.

Questioning as a Culturally-Specific Technique

This chapter has brought to light an important methodological issue in the study of another culture: the use of questions to gain information about a cultural practice. Questions, while they are often useful for acquiring information, do not always get at the whole picture. Activities are structural processes embedded within cultures and which reflect organized and systematic culturally shared ideas (D'Andrade, 1995). It is acceptable and perhaps desirable for the researcher to get involved as a participant in the activities of the study culture in order to find out what is important in the other culture. The need to ask questions then becomes unnecessary. By working in a culture in which decontextualized questions are out-of-bounds, Maynard was obliged to take this approach. While there are limitations of ethnographic participant observation, it is the only way to learn certain things. The best way around the limiting nature of asking questions, whether they are open- or closed-ended, contextualized or not, is to invest the time in long-term ethnographic study (Weisner, 1996). The research presented in this chapter reflects just such an ethnographic approach: the long-term exposure to and analysis of the cultural models of another culture.

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