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Beyond 'Formal' vs. 'Informal' Education: Uses of Psychological Theory in Anthropological Research

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For at least the last ten years[1] cross-cultural research on the cognitive consequences of education has been dominated by the theoretical dichotomy between "formal" and "informal" education. The paradigm of formal education is the style of schooling developed in the industrialized West. It has been defined as any form of education that is deliberate, carried on "out of context" in a special setting outside of the routines of daily life, and made the responsibility of the larger social group. "Informal education" refers to education that takes place "in context" as children participate in everyday adult activities. It is the predominant form in many nonindustrialized societies (Scribner and Cole 1973:555). Research guided by the formal/informal dichotomy typically has taken tests of memory, tests of logical reasoning, and other tests standardized on Western schoolchildren to a society where schooling is not universal. There schooled (formally educated) and unschooled (informally educated) children's performance on the tests are compared, and, time and again, the unschooled

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children's performance is found to be inferior. A reasonable conclusion to draw from this research would be that formal education (or, at least, Western schooling) improves cognitive abilities across the board and should be encouraged in international development efforts.

Recent comparative education research has been much more culturally sensitive (see, e.g., Lave 1977; Scribner and Cole 1981). Yet, the formal/informal dichotomy remains the model by which these findings have been interpreted (Greenfield and Lave 1982; Cole and D'Andrade 1982). Lave probably expressed the frustration of many others when she wrote recently, "We cannot afford to hold as our principal basis for comparing educational forms the school-centric, simplified dichotomy of formal and informal education" (1982:185). She went on to express the following belief:

> It seems unlikely that those traditions within cognitive psychology and learning theory, based on nineteenth-century models of the mind-out-of-its-social/cultural-context, will provide the theory we need, for they reflect the same biases that burden us when we treat school as the normative exemplar of "education." [1982:186]

I agree with Lave that the formal/informal dichotomy needs to be replaced. My primary aim in this paper is to propose a less ethnocentric taxonomy in its place. However, I disagree with Lave's contention that psychological theory has nothing to offer here; in fact, my replacement is drawn from recent research in cognitive psychology. An additional goal of this paper, therefore, is to defend the use of psychological theorizing in anthropological research. Although my discussion will be focused on cross-cultural cognitive research, some of my points are intended to have more general applicability.

I

Lave is not alone in her distrust of psychology. Crick's recent review (1982) of research in the "anthropology of knowledge," for example, aired the suspicion that "cross-cultural psychology is no more than cultural arrogance, since it foists our cultural constructs onto others as if they had some inherent superiority" (1982:290). How well-founded is this attitude?

Anthropologists have good reason to be suspicious of psycholog-

ical research. Many of the difficulties of cross-cultural cognitive research, in particular, have been pointed out repeatedly. Poor translation of tests, use of nonindigenous concepts or materials, and subjects' unfamiliarity with the testing context led to poor performance that was too readily interpreted as indicating inferior ability. Psychologists have overlooked the social context of the testing interchange—how subjects' understanding of what the experimenter expects can be different from the experimenter's understanding. Comparison groups chosen to test the effect of a single variable (lack of schooling, for example) actually differed in many other respects as well. The very premise of the tests (the skills at which Western schoolchildren excel are the only ones worth studying) were ethnocentric. (Rogoff 1981 and Curran 1980 are good reviews of these issues.)

In addition to these oft-noted methodological weaknesses, there was a problematic assumption that lay at the heart of cognitive theorizing. This was the belief that cognitive performance is determined by very broad faculties, such as "short-term memory," "formal operational schema," or "intelligence." On this model, for example, experiments that test immediate recall—whether of syllables, songs, or stories—are all studying performance of a single short-term memory faculty. For cross-cultural research this model implies that non-Western subjects' poor performance (with valid tests) at particular cognitive tasks is indicative of broad cognitive deficits (Rogoff 1981).

A number of cognitive psychologists are now questioning this model of mind. Gardner (1983) proposes that the storage of different cognitive contents (language, spatial, musical, kinesthetic, etc.) in separate regions of the brain leads to cognitive ability being differentiated by content area. Fischer (1980) has broken down Piaget's *structure d'ensemble* into more narrowly defined cognitive structures that can mature at different rates. D. A. Allport (1980) and others believe that cognitive processing is spread out among millions of neural systems tuned in to specific kinds of input, unguided by any kind of "central processor." Cole and Scribner (1974) suggest that cognitive performance reflects practice using or combining specialized "functional systems," rather than possession of generalized abilities. (See also Cole, Sharp, and Lave 1976.) Despite impor-

tant differences among these theories, all have the implication that if poor performance at a given cognitive task indicates any cognitive deficits at all, it is only deficits of a narrowly defined sort. No general conclusions can be drawn about subjects' "intelligence" or "memory."

One reason to reconsider the role of psychological theory in cross-cultural research, therefore, is that recent theorizing is more amenable than earlier theories were to sensitive research. Another reason is one that has always been true: the experimental psychological method is better able to assess the influence of particular variables on outcomes than the holistic anthropological method is. Where practical applications are at stake, as they are in educational anthropology, this is especially important. Psychological theory allows the educator to relate particular desired outcomes to particular educational processes. In my presentation of a taxonomy of forms of learning I will stress generalizations about process-outcome relations that may hold cross-culturally. A cultural relativism that would question any such evaluative generalizations might indeed forestall inappropriate foisting of Western values on non-Western peoples. Such a cultural relativism has a drawback, however. It also prevents consideration of how non-Western practices and theories could improve our own.

II

The discussion in the last section hints at the drawbacks of the formal/informal dichotomy and the criteria I will use for its replacement. Not only is the dichotomy ethnocentric, but its categories are too broadly conceived as whole institutional contexts rather than particular cognitive processes. Categorization by institutional context might be desirable for some purposes, but not for the goal of understanding why different forms of education lead to different cognitive outcomes. A particularly egregious example is the fact that discussions of the concomitants of each form of education always include the criterion that relatives are appropriate teachers in informal education, while nonrelatives are more appropriate teachers in

formal education (Greenfield and Lave 1982; Scribner and Cole 1973). Whether relatives or nonrelatives are teachers doubtless has important consequences for personality development (Herzog 1962) and may also influence the value the learner attaches to the instruction. There is no reason, however, to suppose it affects the sort of cognitive variables these researchers have been studying. Similarly, the importance of the educational setting and the whole concept of "out of context" versus "in context" are poorly explained. Scribner and Cole (1973) cite Western math education as a paradigm of out-of-context learning, because "the child is asked to learn material that has no natural, that is, nonsymbolic, context" (1973:557). Yet, isn't this also true of instruction in the ways of ghosts, which we equally believe to have "no natural context?" This, however, is considered an example of informal education. In addition, the traits said to be associated with formal and informal education are not always found together. Thus, informal education, which is supposed to be largely nonverbal, may consist of demonstrations accompanied by many commands and comments (Childs and Greenfield 1980; Greenfield and Lave 1982). Finally, discussion and research based on the formal/informal dichotomy *really* seems to be about the difference between Western-style schooling and all other forms. The broader category of "formal education" lets in forms of education (such as tribal initiation rites or on-the-beach navigation instruction in Puluwat) that have many of the traits ascribed to informal education (learning is not depersonalized, maintenance of continuity and tradition are valued, and learners are highly motivated).[2]

The taxonomy I am offering as a replacement for the formal/informal dichotomy categorizes forms of learning by the cognitive processes they tap. This should result in a framework better suited to cross-cultural research on the cognitive consequences of education, although not well suited for other purposes. There is no attempt here to offer a complete theory of socialization or to explain affective outcomes of learning. A more serious limitation on my taxonomy is that the psychological theories I draw on cannot account for learning of altered states of consciousness, which is important in many societies. A more adequate psychological theory would need to encompass such forms of learning as well.

III

In constructing my framework for categorizing forms of education some psychological concepts were suitable as they stood; others had to be altered. One distinction in the cognitive psychology literature worked very well for my purposes: that between intentional and incidental learning. Another—between well-defined and ill-defined problems—needed very minor modification. A third—among different acquisition strategies—I have altered drastically here, choosing categories that are not recognized in the current psychological literature. The interrelations among these concepts can be represented as a branching tree (see Figure 1).

Given the particularistic view of cognition I put forward in the last section, it may seem surprising that the taxonomy I propose has only seven categories. Is intentional learning of chemistry really the same

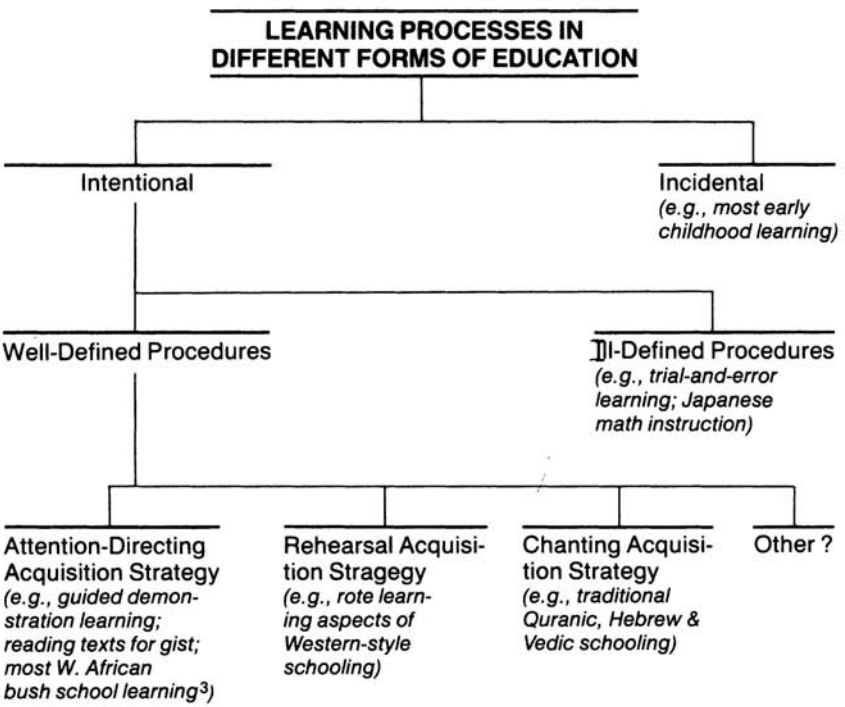

Figure 1.

as intentional learning of cooking? With exceptions to be noted in the course of the discussion, I will argue that the process-outcome relations I describe do hold for a variety of contents. Even if different cognitive contents are processed by specialized structures, they might all be processed in the same way.

Below, I describe the concepts in the diagram in some detail, adducing examples of their application to different forms of education and extrapolating from the experimental literature their probable cognitive consequences.

A. Incidental Versus Intentional Learning

The most basic distinction between different forms of education divides forms of learning that are intentional from those that are incidental. In intentional learning what the learner remembers is "the product of deliberate attempts to remember," while in incidental learning there is no deliberate attempt to remember, rather, what the learner remembers is the "result of interaction with a relatively meaningful environment"[4] (Brown 1975:106). What counts here is the intention of the learner, rather than the teacher. Thus, a two-year-old girl's familiarity with certain pieces of music, developed because her parents deliberately played these pieces to train her "ear," would be considered an instance of incidental rather than intentional learning. (As this example illustrates, however, whether the learner recognizes the situation as one in which he or she is supposed to be learning can depend on environmental cues arranged by others.)

Much of our ordinary knowledge of the world—that grass is green, dogs bark, and lunch precedes supper—is the result of incidental learning. The same is true of many of our skills, from learning customary rules of social exchange to speaking our native tongue. Although children do practice speech, most of what we know of the vocabulary, syntax, and phonetics of our native tongue was just "picked up" in incidental learning. Foreign language study in school, on the other hand, is a good example of intentional learning. Although some aspects of language learning in this context may be incidental, for example, permissible sound combinations and customary stress patterns, typically the schoolchild learns by memor-

izing vocabulary lists and rules of grammar. With few exceptions, school learning is designed to be intentional learning.

In this society school buildings and class period bells serve to mark a place and time for intentional learning. In other societies a week-long adolescent initiation ceremony would serve as an equally dramatic way of saying to the initiate, "Remember well what you are taught at this time." In any society, however, there are less institutionalized ways of signaling that something is to be learned deliberately: a raised voice and eye contact with the learner could suffice. Probably there is no society in which intentional learning is absent, and it might be as common in a society without formal schooling as it is in a society with such schooling.

Most of the examples I have given of incidental learning are of skills or knowledge picked up by young children. Although incidental learning takes place throughout life, it predominates over intentional learning in young children because it is some time before they fully develop the skills needed to learn deliberately. This is especially true if memorization is involved. Brown (1975) lists a number of studies that review the findings in this area. Children as old as eight or nine are still improving their skills in spontaneously elaborating and categorizing material to facilitate its acquisition and retrieval and even in recognizing when an extra effort will have to be made to learn something (Brown 1977). Under some circumstances even college students will do better on an incidental than an intentional recall task (Bransford et al. 1977). A distinction has to be made, however, between difficulty in applying the appropriate learning strategy spontaneously and inability to apply a strategy even under instruction—between production and mediation problems, in the current jargon. Long before children become efficient intentional learners on their own, they are capable of it with help.

In other words, one factor affecting the effectiveness of intentional versus incidental learning is the cognitive development of the learner. Another is the nature of the learner's interaction with the material to be learned. A number of experiments have demonstrated that subjects in incidental recall tests perform at least as well as subjects instructed to remember the material, provided the task instructions lead the former to pay attention to the material and process it in a meaningful way. For example, preschool children asked only to classify pictures recalled them better than children instructed to

remember the pictures (Smirnov and Zinchenko 1969, in Brown 1975. See also Glass, Holyoak, and Santa 1979:138–139).

A final variable impinging on the effectiveness of incidental versus intentional learning is the nature of the material to be learned. According to Brown, "If a child engages in a meaningful activity or experiences a meaningful event, he will retain the essential features of that activity, whether or not a deliberate intention to remember has been evoked" (Brown 1975:126). "Meaningful" is rarely defined in such discussions, but it is usually assumed that classifying an experimenter's list of words is not a meaningful activity, while most of what one does outside of the experimental laboratory is meaningful. School subjects are more or less meaningful depending on whether their presentation leads the learner to relate the material to previous knowledge or treat it like the experimenter's arbitrary word lists. Part of meaningfulness here is familiarity, because a familiar sequence or type of event can be partly reconstructed from memory of similar sequences or events. The well-known Chase and Simon (1973) test of chess players' memory illustrates this principle. Chess masters shown an arbitrary arrangement of pieces on a board remembered their positions no better than weaker players did. When the masters were shown a possible middle-game arrangement, however, they remembered the positions of the pieces much better than weaker players did, because the positions represented configurations that could be labeled and then recalled or reconstructed as following from such-and-such an opening with x, y, and z variations (Chase and Simon 1973).

There is a danger in reconstructing one's memory of a specific event from memory of similar events, however: it is easy to forget idiosyncratic details of the particular event and to confuse it with the more familiar type. Spiro (1977) conducted an experiment that indicates that the likelihood of this occurring is especially great in incidental recall situations. Different groups of subjects heard about a couple planning to marry. All subjects were told that the man did not want children; for some subjects the woman reacted favorably, for others, she reacted unfavorably, to this news. Some subjects in each group were then told in an offhand manner that the couple were later happily married; others that the wedding was called off. Thus, some subjects heard a sequence that is not typical in real life (e.g., disagreement over whether to have children, followed by a happy marriage),

while others heard a more familiar sequence (e.g., no disagreement over whether to have children, followed by a happy marriage). Furthermore, some of the subjects had been told they were participating in a memory test, while others were told only that the experimenters were interested in their reactions to social interaction situations. The latter (incidental) memory group made significantly more errors in recalling the unfamiliar version of the story after a delay than the subjects who deliberately memorized the unfamiliar version did. This difference between intentional and incidental groups was not found when they were recalling a familiar version of the story. Thus, intentional recall may be superior to incidental recall when idiosyncratic details need to be remembered.

In sum, what does all of this show for the effectiveness of forms of education that rely on incidental versus intentional learning?[5] Especially for young children, provided they are interested enough to attend to the matter in question and provided this material is meaningful for them, incidental learning appears to be at least as effective as intentional learning of a particular skill or subject matter. Whether it is more effective is not clear. The experiments in which subjects did better on incidental than on intentional memory tasks were those in which they were led to perform activities, such as imposing taxonomic classifications on words or objects, that they would not normally do in a real-life incidental learning situation. Spiro (1977), however, argues that instructions to memorize lead learners to compartmentalize the material to be learned instead of integrating it with their existing knowledge. He implies that in the long run compartmentalized material may be harder to retrieve than better integrated material. To the extent, then, that incidental learning leads to better integration than intentional learning, it may be more effective for long-term learning.

Forms of education that lead to deliberate learning, on the other hand, appear to be necessary where the learner would not otherwise be motivated to attend to the material, or where verbatim recall or recall of events with idiosyncratic details is necessary. The importance of the learner's motivation to attend to the material, by the way, illustrates that while "affective" and "cognitive" factors can be studied separately, in a given learning situation they are actually intertwined.

B. Well-Defined Versus Ill-Defined Learning Procedures

Intentional learning situations can be subdivided into those in which the learner is faced with relatively well-defined learning procedures and those in which there are relatively ill-defined learning procedures. These terms are cribbed from the distinction drawn in the artificial intelligence literature between "well-defined problems" and "ill-defined problems" (Reitman 1964). Glass, Holyoak, and Santa (1979) explicate this distinction as follows:

> In a well-defined problem the given information, operations, and goal state are all completely specified. . . . Ill-defined problems, on the other hand, are those for which the problem solver has more uncertainty concerning the given information and starting materials, the operations that can be used, and the final product that must be achieved. [1979:394-395]

Since in most educational contexts what varies is only how well the procedures are specified, I have modified the more standard terminology accordingly.[6]

I've also added the qualifier "relatively" to well-defined and ill-defined, because any learning situation will have some elements of each type. Even an apprentice with an opportunity to watch every move of a master craftsman still has to choose which details of the performance to attend to.[7] Still, it is worthwhile to analyze learning situations to see which procedures are specified, which left for the learner to choose. For brevity I will speak of learning situations with "well-defined" versus "ill-defined" procedures, but these should always be understood as marking points on a continuum, rather than as a strict dichotomy.

The concepts of well-defined and ill-defined procedures can be illustrated with some examples from cross-cultural studies. Consider, first, how girls learn to weave in two different Mayan communities. According to Childs and Greenfield (1980), among the maize and bean growing Zinacanteco Indians in Chiapas, Mexico, every adult woman is expected to weave cloth for her family's clothing. Weaving generally takes place outdoors after women have finished their morning chores. Very young girls pick up some familiarity with weaving simply by casually observing their mothers at work. Later they help with boiling the thread and dyeing the wool. At about the age of eight

girls start to make a serious attempt to learn how to weave. At first they spend most of their time just watching the process carefully. Then they begin to help, working alongside their mother or another adult woman. In the beginning the adult gives a great deal of explicit guidance, both explaining and demonstrating the correct procedures. This guidance decreases as the girl becomes more proficient, until, at about the age of 12 or 13, she is competent to weave on her own.

In another Mayan community, this one in Guatemala, weaving is similarly part of the household economy, rather than a specialized craft. Here, however, girls first learn to weave on their own using miniature looms with scraps of leftover materials. Later they graduate to adult-size looms, but still receive very little explicit guidance from adults. Typically, the only advice they receive is from older siblings who do not know much about the process themselves.[8] The Zinacanteco girls who learn to weave by watching their elders need to do little thinking about the best way to weave, because the procedures are completely demonstrated for them. Their learning takes place by following well-defined procedures. The Guatemalan girls learning to weave by trial and error, on the other hand, must consciously figure out the best way to achieve the finished results they see around them. The procedures they should follow are ill-defined.

For another example, consider how math is taught in the United States and in Japan. In the United States mathematics instruction is oriented toward learning certain algorithms for performing addition, subtraction, multiplication, and division of whole numbers, fractions, and decimals. Typically, students become proficient at performing the algorithms before they are able to apply them comfortably to "story problems."

In Japan, on the other hand, children are presented with challenging story problems before they learn the most efficient techniques for solving them. In some classrooms there is extensive discussion of the problem, both between teacher and students and among the students in small groups. Some teachers only give hints regarding the best algorithm for solving the problem, encouraging the students to try to discover it for themselves (Easley and Easley 1982). The result is a leisurely, "Zen-like" process that leaves Western observers wondering impatiently when the teacher will get to the point.[9] In American math instruction, which begins by explaining how to perform a cer-

tain type of operation, then proceeds by giving examples in which the algorithm is applied, the procedures to be followed are well-defined. By contrast, the Japanese practice of asking children to try to solve problems before the most efficient algorithm is taught them exemplifies a teaching strategy in which procedures are ill-defined.

Under the informal/formal model, the differences between the Zinacantecan and Guatemalan Mayan methods of learning to weave are ignored. They are both considered examples of informal education, with supposedly similar cognitive outcomes. Likewise, the differences between Japanese and United States math education are ignored. They are both examples of formal education, again, with supposedly similar cognitive outcomes.[10] In fact, the ill-defined Japanese math education procedures and Guatemalan Mayan way of learning to weave have an important resemblance in cognitive outcomes. In each case, learners seem to be able to use their skills or knowledge in a wider variety of contexts than their counterparts taught with better defined procedures.

Thus, while the Zinacanteco weavers learn only how to reproduce the same small set of designs traditionally woven in their culture, the Guatemalan weavers go on to create original designs. This could, of course, be due solely to a difference in cultural values. Possibly the Guatemalan Mayan community values innovation and the Zinacantecan community does not, but Zinacantecan weavers could create original designs if they had to. Greenfield and Childs's (1980) experiments, however, suggest otherwise. They found that the Zinacanteco girls could not easily reproduce original designs using colored sticks, although most of them had no problem reproducing their traditional designs with the sticks. Greenfield herself speculates that the observation method of learning among the Zinacanteco and the trial-and-error method of learning among the Guatemalan Mayans are responsible for the difference in their originality.

Correspondingly, Japanese students are capable of using their math ability to solve a greater variety of problems than American students at the same grade level can solve, according to international mathematics achievement tests (Easley and Easley 1982). This result should not be credited too hastily to greater inherent mathematics talent among the Japanese or to the exhortations of devoted Japanese mothers. Jack Easley, a researcher and consultant on math and

science education, spent nearly four months observing math education in Japan. When he returned to the United States he used the Japanese emphasis on story problems to help a Chicago elementary school teacher improve the mathematics problem solving skills of her inner-city students. After three months of this approach the class all came up to grade level on standardized mathematics achievement tests, and it was the first time in ten years that her students had all done so (Easley, personal communication).

The conclusion I've drawn about the effects of learning with ill-defined procedures corresponds with findings from psychological experimentation. Greenfield cites the following experiment by Kaye and Giannino (1978), in a North American context, to explain the difference between the Zinacantecan and Guatemalan weavers' originality:

> Their study compared three methods of teaching 8-year-old boys and adult males how to open a puzzle box: trial and error, verbal shaping ("you're getting warmer/colder"), and simple demonstration. The box opened when the subject pushed a certain button on each side. A transfer task involved an identical-looking box that opened when the subject pushed a button on the front. The demonstration-observation method produced the most effective original learning but the least successful transfer to a new situation. [Greenfield and Lave 1982:186]

In an experiment more closely approximating actual teaching conditions, Babikian (1970) found that when Archimedes' principle of buoyancy was explained to eighth graders and then demonstrated in the laboratory, students could repeat the principle and answer multiple-choice questions about it better than students left to figure it out for themselves by observing the sinking and floating of various objects. When questions were posed regarding the buoyancy of objects in novel situations, however, high ability boys and girls left to figure out the principle themselves outscored those who had the principle explained to them; low ability girls of the first group performed almost as well as low ability girls of the second group, and only low ability boys still did better if the principle had been explained first (in Cronbach 1977).

To sum up, the findings of anthropological fieldwork and psychological experimentation lead to the same conclusion. Well-defined procedures are more efficient than ill-defined procedures at imparting a particular skill or piece of information.[11] On the other hand, ill-

defined procedures, much more than well-defined procedures, promote originality and ability to apply one's skill or knowledge in a wide variety of contexts.

Intuitively it makes sense that the learner who has had to make conscious choices among different procedures would have a better grasp of the consequences of alternative procedures and would be better able to put them into place to do original work than a learner who has practiced only the one right way. It seems likely, however, that the value of ill-defined procedures for developing transferable skills or knowledge would be limited to situations in which conscious intervention makes a difference, as, for example, in creating new weaving designs or solving math problems. For strictly motor skills, trial-and-error learning probably does not transfer to new situations. Thus, high jumpers who figure out a technique on their own probably cannot transfer their skills to pole vaulting any better than high jumpers who learn their technique from someone else. In some contexts, trial-and-error learning may not have any redeeming virtues.

C. Different Types of Acquisition Strategies

Intentional learning situations with well-defined procedures can be further subdivided according to the type of acquisition strategy the learner employs to input the presented information into memory.[12] I will discuss three types of strategies here: simply directing attention to the information, rehearsal, and chanting. This breakdown is not one that would be used by cognitive psychologists—they might not consider attention directing to be a strategy and would question separating chanting from other forms of rehearsal—but it is a useful way to distinguish among the different forms of education found cross-culturally.

(1) *Directing attention.* Directing one's attention to some display is the minimum strategy necessary for all forms of intentional learning, and, often, it is all that is necessary. If I want to remember the plot of an interesting novel, all I have to do is read it. The plot will stick with me without my making any particular effort to memorize it. Similarly, if I were to watch my mother gather roots and berries on several different expeditions, I would eventually form a detailed knowledge of edible and inedible varieties, where they are found, and how to harvest them, without having done anything more to learn all of this

than deciding to watch. (This information could also be picked up incidentally, but in that case it's not correct to say that the attention-directing strategy was employed.)

These examples indicate some of the features of attention directing as an acquisition strategy. First, it is applicable to both propositional knowledge (e.g., knowing that *Madame Bovary* is about a bored young French housewife) and to skills (e.g., knowing how to forage for roots and berries).

Second, it is most effective when applied to meaningful material that does not have to be learned verbatim. In the typical laboratory experiment, simple attention directing is not sufficient. When children were asked to remember a few pictures from a larger array, those who rehearsed the names of the pictures did better than those who did not rehearse and, presumably, did nothing more than attend to the array (Hagen and Stanovich 1977). In this respect, the attention-directing strategy is like incidental learning.

Third, the attention-directing strategy is often used outside of symbolically well-defined learning situations, which means that its use is not obvious to the outside observer. This has led some researchers to overlook the possibility that it occurs and to see incidental learning as the main alternative to formal schooling. Using Daniel Wagner's data on Yucatec Mayan subjects Cole and Scribner (1977) expected "absolute levels of incidental recall to be higher for the less educated subjects on the assumption that much of what they know is 'picked up' rather than deliberately learned" (1977:252). Their hypothesis was not confirmed. One reason why it failed might be an incorrect assumption that incidental learning is the predominant form among unschooled populations. Perhaps intentional learning is as common among unschooled populations as among schooled populations, but a simple attention-directing strategy prevails over more elaborate mnemonic strategies. On the other hand, it could be true that unschooled Yucatec Mayan children do much more incidental than intentional learning—but this possibility should be investigated empirically rather than assumed a priori, keeping in mind the subtle cues that may be the only indications that intentional learning is taking place. Since some observers will think of incidental learning, which is passive, as requiring less intelligence than any intentional learning process, it is important that unschooled Third World pop-

ulations not be characterized as primarily incidental learners unless there is good evidence for that assertion.

Finally, it bears repeating that not only is the attention-directing strategy also common in advanced industrial societies (see literary plot example, above), but more elaborate strategies are doubtless employed in the many instances in other societies where verbatim recall is necessary; for example, when Maori speech makers memorize stock phrases and proverbs or Iatmul men learn thousands of clan names (Salmond 1975; Bateson 1958).

(2) *Rehearsal.* Rehearsal is probably the best-studied acquisition strategy because experimental studies of memory usually have subjects memorize arbitrary nonsense syllables or word lists—the kind of material that is not easily remembered otherwise. Although experimental psychologists usually distinguish between simple rote rehearsal and more elaborate strategies that combine rehearsal with taxonomic categorization, self-testing, or adding meaningful links between arbitrary stimulus pairs, these distinctions are not necessary for the sake of categorizing the forms of education found around the world. Wherever recall of relatively meaningless material is expected, good students will eventually learn whatever modifications of the basic rehearsal strategy are necessary to retain the material at hand.

The use of "students" in the last sentence was deliberate, because formal schooling in most parts of the world typically demands a greater use of the rehearsal strategy than does education outside of schools. First of all, "rehearsal" should be understood here to refer only to repetition of verbal material. We commonly speak of rehearsing music, a play, or a gymnastic routine, but psychologists' findings about rehearsal of verbal material may not generalize to these other domains, so these examples should be distinguished from rehearsal of verbal materials. Since much nonschool learning is of skills like cooking or farming, the question of rehearsal of verbal material never arises. What verbal directives are given in the course of such instruction either need not be remembered verbatim or are usually repeated so often that simply paying attention will result in their being remembered. The same is true of the myths and accounts of group history told for entertainment, instruction, and social validation around the world—there is no need for most

members of the audience to rehearse this information. The same cannot be said of learning to connect a list of early explorers of the Americas with the places they visited or memorizing the conjugation of Latin verbs. Although these facts could be presented in a way that would make rehearsal unnecessary—through frequent repetition or presentation in a meaningful context—usually they are not.[13]

For short-term recall of relatively meaningless material, especially, rehearsal is a more effective strategy than simply directing attention to the material (Gates 1917). On the other hand, unless rehearsal is combined with conversion of arbitrary material into meaningful material, it is not very effective for delayed recall. For effective long-term verbal memory it is helpful if the material can be integrated into the existing knowledge base, so that the material need not be recalled as a separate unit but can be reconstructed from other things known (Brown 1975).

(3) *Chanting.* In widely varying times and places societies have hit upon the same method of conducting elementary education—students memorize material by repeating it, in sing-song fashion, aloud. This was true in the Indian *pathśala,* the Hebrew *cheder,* and the one-room schoolhouse of 18th-century America, and is still true in Quranic schools (Pollak 1981, 1982a, 1982b; Scribner and Cole 1981).[14]

The conventional view of chanting would be that it is nothing more than one type of rehearsal—one in which quasi-musical and rhythmic cues are added to facilitate recall, or in which the material being memorized (in traditional religious schools) consists, almost exclusively, of lengthy prose passages, rather than the disconnected facts the Western schoolchild typically learns. If this is so, then certain qualitative features of rehearsal learning should apply to chanting learning: the primacy effect in serial recall (improved recall of the first few items in a series) or increase in children's recall capacity with age, for example. So far as I know, no research has been done in Western experimental laboratories to see whether chanting does have the same features as nonrhythmic and/or silent rehearsal. There is, however, some cross-cultural data that strongly suggest that chanting is a distinct type of acquisition strategy.

In the last ten years there have been some interesting investigations of Quranic students' memorization abilities. Much to the surprise of

researchers studying the performance of these subjects, who devote practically all of their school time to memorizing the Quran, they have done very poorly on standard serial and free recall tests. On the serial recall tests they, like unschooled subjects, do not show a primacy effect—one sign of rehearsal (Wagner 1978; Scribner and Cole 1981). Wagner has attempted to explain these results by claiming that since Quranic students have been memorizing a body of meaningful prose, the Quran, they have been using the "semantic" memory system, whereas his and others' experiments on memory of arbitrary collections of pictures or words call on the "episodic" memory system (Wagner 1981:203). This explanation is unsatisfactory. Although "semantic" and "episodic" are used differently by different researchers, there is general agreement that semantic memory involves memory for gist rather than exact reproduction of input. Since Quranic students are expected to learn the scriptures word for word, gist memory is not sufficient. They are clearly involved in something closer to episodic than semantic memory, if either of these categories is appropriate.

A much better explanation for the Quranic students' poor performance is that they are accustomed to using a chanting acquisition strategy and chanting should be viewed as a separate genus of acquisition strategies, rather than as a species of rehearsal. Some telling evidence for this supposition can be drawn from a close examination of Scribner and Cole's (1981) research on Quranic students' mnemonic abilities. In a free recall study, subjects classified 24 common objects. They were asked to recall those objects, then the names of the objects were read aloud and, again, subjects were asked to recall them in any order. Regression analysis did not find any direct evidence that Quranic study made any difference in performance at these tasks (Scribner and Cole: 125, 223). In a subsequent study, the authors "tried to model the procedures more closely on Qur'anic remembering." Pictures of common objects were presented one at a time. For five subsequent trials as the experimenter presented a card, the subject had to name the next card. On this serial anticipation test Quranic students performed better than nonliterates, but less well than Western-schooled students. Finally, after more observation of the methods of Quranic instruction (and after a few modifications), Scribner and Cole devised the following test, using 16 drawings of common objects:

The experimenter laid the picture cards face down in a row in the predetermined order as he explained the procedure: "Here I have sixteen cards with different pictures on them, face down on the table. First I'll show you one and name it to you. Then, when I put it face down on the table, you name the picture you saw. Then I'll name and show you two. When I turn their faces down on the table, you name the pictures, but starting from the first one up to the picture I last named and showed to you. That's how you'll continue to name them until we get to sixteen. But always remember to start naming from the first picture to the last named and shown to you." [Scribner and Cole 1981:229]

On this test the Quranic students outperformed all other groups tested, including Western-schooled students, and regression analysis showed years of study of the Quran to be a factor significantly affecting recall (Scribner and Cole 1981:230).

The authors attribute the Quranic students' improved performance on the last test to use of a similar "incremental" method of teaching in Quranic schools, although they comment in a footnote that more detailed observations have shown this method to be "most prominent in early learning stages" (1981:319). This makes it puzzling why better incremental recall should be correlated with *increased* years of Quranic schooling. An alternative explanation for the results of Scribner and Cole's series of tests is that the more practice the subjects had at naming test items out loud, the greater the advantage of Quranic students over other groups. In the initial free recall test, subjects were not instructed to practice saying the names of the objects aloud and the Quranic students did no better than anyone else.[15] On the serial anticipation test, subjects had an opportunity to say the names of the pictures out loud, although their practice would have had hesitations and inaccuracies because they had to recall an item before naming it. Quranic students did relatively better at this task, although less well than Western-schooled subjects. In the final task, subjects had the opportunity to practice chanting the names of the pictures after the experimenter said them. Under these conditions, most similar to Quranic schooling, the Quranic students outperformed all other groups. These results make the hypothesis that chanting is a special type of acquisition strategy difficult to ignore. They also show that Western-schooled students' skill at rehearsal does not transfer to a situation where a different acquisition strategy is necessary.

These cross-cultural findings fit with one current model of cogni-

tion that sees song storage and language storage as mediated by different brain structures (Gardner 1975). It may be that material learned by chanting is cognitively processed as songs are—and recalled in the same effortless way that songs can be. This could be the physiological basis of the preference for chanting to facilitate rote memorization in so many cultures.

(4) *Other?* In Bali, Japan, and doubtless many other societies, children learn a variety of motor skills by having their limbs put through the motions of the activity being learned (Bateson and Mead 1942; Benedict 1946). Further research may show that this acquisition strategy shows unique learning curves or other properties that would indicate it should be distinguished from the others I have discussed. Further cross-cultural research will doubtless bring additional acquisition strategies to light. This "other" category indicates my recognition that my taxonomy is probably incomplete.

The distinctions I have described above—between incidental and intentional learning, learning with ill-defined versus well-defined procedures, and use of different acquisition strategies—were chosen because there was a certain amount of experimental data available about them and because they held promise for constructing a refined taxonomy of the forms of learning found cross-culturally. There are other leads that might be investigated profitably. One is Rogoff's interesting research relating Mayan mothers' teaching styles (verbal instruction vs. demonstration) to their children's performance on different types of memory tests (verbal vs. spatial). Verbal instruction led to better performance on verbal memory tests only—its superiority did not carry over to spatial memory tests (Rogoff 1981). Another is D'Andrade's (1981) distinction between content-based and recoding abstraction. An example of the former is the "chunking" of individual moves into meaningful combinations that a chess player learns: more abstract categories come to be used, but these are expressed in the same medium (patterns of chess pieces) as the phenomena being categorized. With recoding abstraction, on the other hand, there is a translation into formal algorithms expressed in a different medium. The estimating procedures of unschooled tailors would be an example of content-based abstractions, while the school-learned techniques of translating apples and oranges into x's and y's would exemplify use of recoding abstraction. D'Andrade believes the latter is a less natural,

more effortful sort of abstraction (D'Andrade 1981). The difference between these types of cognitive processes may be what really underlies the differences that have been labeled "in context" versus "out of context" learning.[16]

IV

As the experiments reported in the last section indicate, current cross-cultural cognitive researchers have begun to move beyond "the more schooling the better" hypotheses that used to dominate the field. Yet, even though this research has turned up important differences among the forms of education grouped together by the terms "formal" and "informal" education, there has not been a significant effort to replace that dichotomy with a more useful set of categories. My primary purpose in this paper was to meet this need. My taxonomy is not necessarily exhaustive, but the basic categories of incidental learning, intentional learning with ill-defined procedures, and intentional learning with well-defined procedures (and attention-directing, rehearsal, or chanting acquisition strategies) encompass most of the important forms of learning present around the world, while highlighting their different cognitive effects.

From an anthropological standpoint, my taxonomy has some unusual features. First, it slices across institutional forms, placing some of their learning situations in one category, some in another. Thus in Western secondary schools, math and literature classes may require use of the attention-directing acquisition strategy, while Latin classes demand use of the rehearsal acquisition strategy. Second, it highlights similarities between the forms of education found in pre-industrial and industrial societies, placing instances of each in the same category in several cases. For example, both Japanese schoolchildren in their math classes and Guatemalan Mayan girls learning to weave are engaged in intentional learning with ill-defined procedures. Likewise, Zinacantecan girls learning to weave by watching their elders and college students learning the features of French Surrealist poetry by reading it are equally using a simple attention-directing strategy in intentional learning with well-defined procedures.

These features of my approach could be criticized on the grounds that I am looking at learning processes out of their cultural context. Perhaps learning with ill-defined procedures, for example, doesn't "mean the same thing" in Japan as it does in Guatemala. It could be that ill-defined procedures are typically used in one of the societies for learning culturally valued subject matters and in the other society for learning less valued subject matters. This would be interesting and useful to know. Still, agreement between anthropological and psychological research about process-outcome relations—for example, that ill-defined procedures improve students' abilities to generalize their learning creatively—supports my contention that some cross-cultural generalizations can be drawn. For each of my categories, the generalizations I have argued for are not of the form, *x* learning process is better than *z* process for all purposes. Instead, for each type I have shown that the effectiveness of a given learning process depends on characteristics of the learner, the subject matter, the environment, and how the knowledge is to be used. These features mean that my framework provides no aid to anyone seeking to demonstrate the superiority of Western schooling over all other forms. The formal/informal dichotomy, on the other hand, while more respectful of institutional context, encouraged research that denigrated non-Western forms of education.

At the beginning of this paper I quoted some remarks by anthropologists who implied that much, if not all, psychological theory is inherently ethnocentric. I hope I have shown that this is not the case—that psychological theory can be drawn upon to promote culturally sensitive research. The research that underlay the formal/informal education dichotomy tended to be ethnocentric in the extreme in its focus on the superiority of Western schooling over other forms of education. To recognize, as researchers are now doing, that indigenous forms of education can be well-adapted to needs in the societies where they are found is undoubtedly a great step forward. Yet, this cultural relativism can stop the foreign investigator from taking the important further step of asking, "How might forms of education present in other societies prove useful in my own society?" The marriage of psychological theory and anthropological sensitivity may lead to answers to that question.

NOTES

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[1] Since publication of Sylvia Scribner and Michael Cole's landmark article, "Cognitive Consequences of Formal and Informal Education," (1973). Scribner and Cole's formulation was greatly influenced by Bruner (1966).

[2] See traits of formal and informal education listed in Greenfield and Lave (1982). Scribner and Cole (1973) recognized this problem but didn't resolve it.

[3] See Watkins (1943) and Caine (1959) on bush schools.

[4] Incidental learning would draw on Leontiev's "natural memory," as described in Cole and Scribner (1977).

[5] It may seem strange to speak of a form of education that relies on incidental learning, especially when it is unintentional for the teacher as well as the learner. I am using "form of education" to indicate any teaching or learning situation, whether designated as educative or not by the participants. There is also the possibility of education where the teacher deliberately arranges for the student to learn incidentally, as is the case in Suzuki music training.

[6] Educational psychologists seem to have the same distinction in mind with the contrast between "expository" and "inductive" teaching procedures (Cronbach 1977:544) or between "guided" and "discovery" learning.

[7] There has been research showing that practice at control of attention and at noticing spatial relationships and the muscular sensations accompanying actions will lead to improved performance in a variety of manual skills (Cox 1933, in Cronbach 1977:423).

[8] The Guatemalan description is from Greenfield and Lave (1982), based on research by Maria and James Loucky, apparently unpublished.

[9] R. A. LeVine confessed to this reaction to Japanese math instruction in his comments during a presentation by J. Easley (Easley 1982). Easley noted the connection with Zen methods of instruction on that occasion.

[10] To expect all the varieties of modern schooling present around the world to be alike in all essential respects is to ignore the possible influence of indigenous educational traditions (e.g., Zen instruction in Japan) and the educational models of different colonial powers.

[11] There are additional experiments backing up this conclusion. Thus, subjects learning to trace a maze learned much faster if for the first few trials the wrong turns were clearly marked (Wright 1957, in Cronbach 1977)—that is, well-defined procedures led to faster maze learning than leaving it to the subjects to find the best path on their own. Similarly, archery students reached a higher level of proficiency after 18 lessons if they were shown how to stand, hold the bow, and release the arrow than if they were just instructed to pay attention to form but left to figure out the best techniques on their own (Davies 1945, in Cronbach 1977).

[12] In learning situations with ill-defined procedures, once the skill or principle is figured out it also has to be remembered. Usually, however, the figuring-out process itself is sufficient to make the information easy to remember; no further effort is needed.

I have chosen to concentrate on acquisition rather than retrieval strategies here simply because more is known about them.

[13] Field studies haven't borne out the formerly common belief that intentional verbatim memorization is *more* common in preliterate than in literate societies due to the absence of alternative means of storing information in the former.

[14] Pollak's (1982b) discussion of Islamic education draws on Wagner and Lofti (1980) and other research by Wagner.

[15] Vai-Arabic biliterates did well on this test, but that result is difficult to interpret.

[16] There are some cross-cultural findings my taxonomy does not address: the superiority of schooled over less schooled subjects at Piagetian formal operations tasks; schooled subjects' greater willingness to solve logical syllogisms solely on the basis of the premises given; and a greater tendency—not found consistently—for schooled subjects to use taxonomic rather than functional bases of classification. The results on the Piagetian formal operations tasks are probably best explained by contact with scientific methodology in Western schools. As for schooled subjects' understanding of logical syllogisms and use of taxonomic bases of classification, Cole and D'Andrade (1982) are probably right in attributing this to the emphasis in Western schooling on manipulations on "words in the absence of manipulations on objects and people" (1982:25). This does not happen merely because in Western schooling learning takes place "out of context" from everyday life—for the same can be said of institutionalized religious education, West African bush schooling and of tribal history learned around the campfire (as Scribner and Cole, 1973, point out). The critical feature of Western schooling pertinent here is its emphasis on the "3 Rs," that is, on symbol systems and their use, rather than on particular bodies of knowledge. Of course, specific bodies of knowledge are important, too, but rather less so in Western-style schooling than in other forms of education around the world.

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