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## The Influence of Schooling on Concept Formation: Some Preliminary Conclusions\*

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During the past two decades there has been an unprecedented outpouring of psychological research on the cognitive consequences of schooling. There have been important companion efforts in anthropology and sociology. It is fair to say that despite all of the effort that social science has put into assessing the influence of schooling on cognition, there is no unified theoretical account of our cumulated data. Lacking an agreed upon theory, different analysts distrust each other's data; methodological wrangles are at the center of attention; a bore and a necessity.

We will not seek to summarize the extant data in detail. That has been done often and competently (for a recent review see Rogoff, 1981). Instead, we will present a schematic overview of the main phenomena that stand out from the haze of uncertain procedures and less certain assertions that count as facts. The reader should keep in mind that disputes about basic facts are not trivial. *All* research on the effects of schooling has been carried out with contrast groups constructed on the basis of social forces beyond the analyst's control. The natural logic of constructing school-nonschool comparisons founders on the equally natural fact that schooling is not assigned at random to human beings, not even human beings of a specified age. In technical parlance, experimental comparisons of the influence of schooling are not possible because we do not have random assignment of subjects to groups. There is evidence from many sources that even in countries that instituted universal education programs following World War II, children have not been selected at

random to go to school. Among the characteristics that have been found to differentiate children prior to entering school (in addition to demographic characteristics like sex and economic status) are performances on various cognitive tasks used by psychologists to measure intelligence and development. (See Fahrmeier, 1975; Irwin, Engle, Yarbrough, Klein, & Townsend, 1978; Sharp, Cole, & Lave, 1979). Since the domain of influence specified for this discussion is the influence of schooling on concept formation, these indications of selectivity must concern us. In common sense terms, we might suspect that children who go to school have been selected for their intelligence. If we use cognitive tasks to assess outcomes of schooling, our tests may mistakenly measure prior ability.

Another whole set of injunctions concerns the problem of equivalent test conditions. Instructions, materials, procedures all ought to be equally familiar to comparison groups. We prefer, for the moment, to postpone this discussion. There is a sufficient body of data that meet the normative standards of our disciplines, taken singly, to permit generalizations that can win wide acceptance. It is in juxtaposing explanations for first order generalizations that troubles arise, troubles which will bring us back to the question of method and generalization.

### What the data tell us

Putting aside the certainty that matters are vastly more complex than any simple partialling of the data can convey, the following assertions appear a promising basis for further discussion:

- 1) For cognitive tasks where the basis of solution chosen by the analyst is based upon functional relations among problem elements, especially if those problem elements are common to everyday experience, Schooled and Nonschooled populations perform alike. Age comparisons in such tasks reveal that there is an increase in correct performance from childhood to adulthood (roughly, 6-20 years).
- 2) For cognitive tasks where the basis of solution chosen by the experimenter requires the use of taxonomic classification systems Schooled populations outperform Nonschooled populations, *unless* the taxonomic structure of the task is made explicit.
- 3) For cognitive tasks where specialized information processing strategies are a part of the analyst's solution to the problem, Schooled populations outperform Nonschooled populations in ways that relate directly to the hypothetical strategy (e.g., rehearsal).
- 4) For cognitive tasks where language itself is the analyst's topic, Schooled populations are more likely than Nonschooled populations to treat the topic as hypothetical.

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## Two interpretive frameworks

The facts, as they say, appear plain enough. How are we to account for them? Assuming that low level methodological artifacts cannot be martialled in sufficient number to shake our belief in the generalizations we have just made, what more general ideas can account for them, and the forms that they take in various parts of the world today?

All accounts for the consequences of education would agree that students learn new configurations of activities. At this point, consensus leaves the discussion. Within and between disciplines we have no agreement on how various phenomena are to be interpreted. However, all is not chaos. Among the contending voices there are configurations of ideas, theoretical strategies perhaps, (paradigm's in Kuhn's term) that claim a broadly acceptable framework of interpretation. Dominant among these paradigms are developmental theories which see development as the gradual replacement of one qualitatively distinct configuration of adaptation for another. These accounts claim too that a developmental transformation occurs at the level of the basic level of the theory's unit of analysis (a word for Luria, Vygotsky, Burke, Austin; a schema for Piaget, Norman and Rumelhart, Schank and Abelson and many others).

After discussing a generalized version of a developmental account of schooling effects, we will present an alternative approach which views schooling effects in terms of systems of mediated activity.

### A developmental account of the data

In their most common form, developmental accounts of schooling effects go beyond the notion that there are developmental sequences characterizing different functional systems to implicate basic differences in the content and processes of conception as well (Greenfield, 1972; Luria, 1976). Such theories also hold that "in some way" the basic units upon which conceptual thought is based are likely to undergo fundamental changes as a result of schooling.

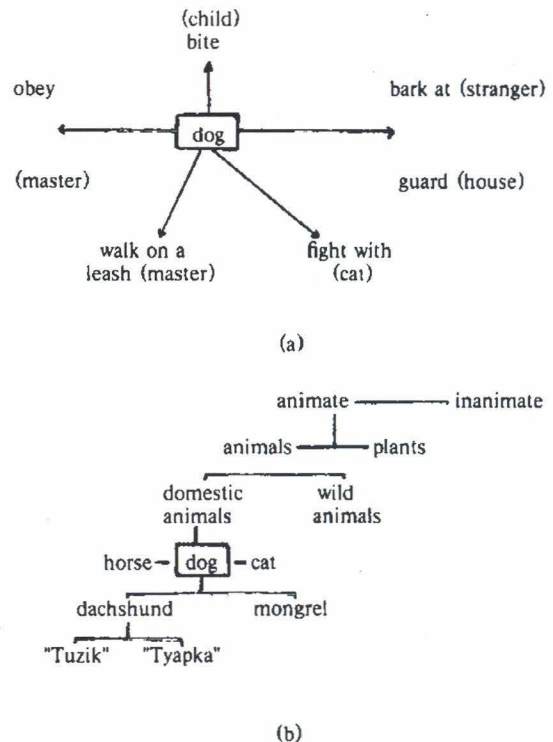
Theories vary in the basic unit of analysis they posit, posing difficult problems of data interpretation when we move from one experimental instantiation of a theory to another. To keep this discussion to manageable length, we will present one theory from this class of theories, in this case the work of Alexander Luria. We select Luria's work because he presents a very concise account of this kind of theory using as an example a kind of data for which we have relevant school-nonschool comparisons. The data are from a free association test administered under Cole's direction as part of a project to assess the influence of schooling on concept formation. The data have been reanalyzed by D'Andrade as part of the discussion which produced this paper.

Luria (1982) presents a theory of the development of word meaning which stands as one expression of his more general theory of development. He gives the following example:

..."dog." For a small child, a dog may be something terrible if he/she has been bitten by one, or it may be something quite pleasant if the child has grown up with a dog and is accustomed to playing with it. Thus the word "dog" has an affective sense. This affective sense is the essence of the word's meaning. During the next stage, the word "dog" evokes the memory of a concrete experience (a dog being

fed, a dog guarding the home, a dog keeping thieves away, a dog carrying things, a dog fighting with cats, etc.). In other words, the word "dog" begins to give rise to a whole range of concrete images of situations. For a child who is studying science, and even more so for a college student, a dog is an animal that is included in an entire hierarchy of mutually subordinate concepts.

**Figure 1**  
Scheme of the structure of semantic fields in ontogenesis.



What we have said above may be illustrated in . . . [Figure 1].<sup>1</sup> The first diagram illustrates a word's meaning structure when a concrete image has replaced affective connotations. Here, word meaning involves actual practical associations or concrete situations. Each element is connected with this word on different grounds. A dog obeys its master, guards the house, bites a child, etc.

The structure of word meaning takes on an entirely different character at later stages. The lower diagram illustrates that the word enters into a system of hierarchically connected and mutually subordinated categories. It acquires, as linguists say, a paradigmatic character. The word's meaning is situated in an hierarchical system of abstract oppositions. Thus, a dachshund is not a mongrel, but they belong to the same category; a dachshund is a dog not a cat; a dog and a cat are animals and not plants; etc. These categories are mutually subordinated in a hierarchy. They form the system of abstract concepts and are distinguished thereby from the concrete situational relations characteristic of words at an earlier stage of development. At the stage of concrete concepts, the key role is played by situational, object-actuated bonds; whereas at the stage of abstract concepts, the key role is played by the verbal and logical hierarchically constructed bonds. We may therefore say that changes in meaning simultaneously involve changes in associated processes.

Thus, following Vygotsky, we would conclude that word meaning develops even after the object reference of a word is stabilized. This fact means that the structure of

<sup>1</sup>Figure 1 is our facsimile of Luria's diagram (1982, p. 52).



consciousness also changes. During the earliest stage of ontogenesis, consciousness has an affective character. During the next stage, it begins to assume a concrete character. Words, through which the world is reflected, evoke a system of practically actuated connections. It is only at the final stage that consciousness acquires an abstract verbal-logical character, which differs from the earlier stages both in its meaning structure and in psychological processes, although even at this stage the connections that characterize the previous stages are covertly preserved (Luria, 1982, 51-52).

This account nicely summarizes the view that development proceeds by a series of stage-like transformations from an undifferentiated to a differentiated system, and hence to a system which is described as rational, logical, integrated by rules and maximally adaptive, e.g., fully developed. Development, by this view, creates new systems at the level of the basic units of analysis in the theory.

Note, however, that old systems don't go away entirely. As Luria puts it in one place, "the connections that characterize the previous stages are covertly preserved." The question of what happens to the old systems when new ones are invented is a difficult one in developmental theory and we will not be able to resolve it here. But we can get some idea of what Luria means by his examples; early, lower order processes reappear in times of stress, alcohol, brain damage. In this context, the image that is evoked is of primitive systems being "uncovered" when the layer above them is peeled away. This image is very pertinent to Luria's interpretation of functional systems in the brain (Luria, 1976). However, it is not the only kind of example that Luria gives. In discussing results from experimental tasks involving word classification, he notes that he and others used these tasks to compare the cognitive processes of people who vary in their "socioeconomic living conditions and their level of school" tend to classify according to iconic, concrete-situational principals. He is at pains to note that these subjects "can also understand the other, categorical, form of classification, but they consider it 'unimportant.'" (Luria, 1982, p. 63)

*An example contrast: What's the first thing that comes to mind when....?* Luria's account of the change in meaning from the concrete-situational to verbal-abstract stage is precisely the change that schooling is found to produce in a variety of cross-cultural data.

As a concrete example, consider the data in Figure 2. (See page 22).

The data in Figure 2 are a classification of the words given as an associate to "duck" by groups of Mayan people living on the Yucatan peninsula. Each of the groups labeled across the top of the figure consists of twenty people, more or less evenly divided between male and female. The groups labeled "Maya" are from families where Mayan is the dominant language used in the home, although the children attend school where Spanish is the language of instruction. "Mestizos" are people who speak Maya and Spanish, and among whom Spanish dominates as the language of choice in most situations. Ladinos are people of European descent who are unlikely to speak Maya. Culturally the Mayan families would be considered more traditional than the other two groups; economically these families are likely to be poorer and more agricultural in orientation.

Subjects were read words one at a time from a list consisting of 15 words, 5 each from one of 3 common

categories of words in use in the community. They were instructed to say the first 5 words that they thought of each time they heard a new stimulus word (e.g., "duck"). Each subject was read the list in a different, randomly constructed order, and all of the response words were recorded as they were spoken.

The data entries in the figure represent the entire set of responses arrayed according to the semantic relations between stimulus word and response word. Scanning first the data for the most educated group, we see that high schoolers demonstrate a configuration of responses in which categorically and semantically related words dominate. All other groups respond in a very similar manner to each other, and differently from the high schoolers; they designate characteristics of the thing named. Some of these characteristics are physical features of the object (its color), others are typical actions that can be done to or by the object.

It should be clear, even at a glance, that the pattern of performance that distinguishes the word associations of the groups contrasted by amount of schooling fits very neatly into Luria's developmental model of word meaning. Taken at face value, the conclusions to be drawn from such results are far reaching indeed: schooling produces a fundamental restructuring of the lexicon upon which verbal reasoning is based. Here the notion that certain functions develop little or not at all in the absence of schooling has wide implications because it is built into the basic unit of analysis; into the structuring principle of the contents of thought.

Conclusions with such far reaching implications aren't drawn lightly, and at this point virtually everyone pauses. Are there data which would lead us to modify the implications that are looming at us? Is there a really important way in which primitives think like children?

*Doubting data.* Although there is a long tradition of using free association data as a window on the organization of the lexicon, there have also been data warning us that there are *no* transparent windows on the organization of lexical knowledge. Thus, while shifts in the organization of responses like those shown in Figure 2 have repeatedly been obtained, their developmental status is much debated.

One line of research undermining straightforward developmental interpretations was initiated by Stoltz and Tiffany (1972). They collected free associations from college students using two lists of words. The first list consisted of a set of relatively high frequency English words (e.g., "erotic" vs. "sexy"). The second list consisted of lower frequency synonyms of the same words. They found that the same subject would produce word response configurations differently for the high and low frequency item of each synonym pair; high frequency items produced Luria's "verbal-abstract" response system, while the low frequency words produced "concrete/situational" responses. The existence of two levels of development in the same person at the same time for two instantiations of the same concept makes it very important for theories of the development of word meaning to get a lot more specific about the status of "lower stages" in the system of psychological processes. In this case, different stages correspond to different frequencies of experience.

A second line of research that gets us to doubt that



**Figure 2**  
**Responses to the stimulus word, "duck"**

	<i>Ladino High Sch</i>	<i>Mestizo 8-10</i>	<i>Mestizo adult</i>	<i>Mayan 8-10</i>	<i>Mayan adult</i>
Is a kind of a duck	fowl 6 pajaro "	small one " "	" " "	" " "	male female "
Is a characteristic of some ducks	wild 3 black "	large 3 old black 2 dirty (?) pretty	fat tall small black white valuable	fat small 3 large 4 black dirty clean many (?) pretty 2 good white brown useful	dirty yellow black useful necessary clean pretty white 3 large small 2
Is a kind of duck	female duck 3 " "	ducklings " "	female ducks 3 " "	" " "	duckling " "
Is like (constrasts with) a duck	goose 5 sea gulls chicken 5 hen 3 dove eagle (bird) cardinal turkey 2 peacock	chicken 2 turkey " "	" " " "	chicken turkey dove	chicken " "
Is a part of a duck	wings bill 2 feathers	wings bill "	feathers beak wings	" " "	" " "
Ducks are found in/near/at	sea nest water	water 4 house grass	water lugar (?) sea market house	sea water "	sea water house land yard town egg 2 egg-ova "
Ducks have	nest egg "	egg " "	egg 4 " "	egg 4 " "	egg 2 egg-ova "
Duck (Typical action)	swim (flying) "	swims 5 gobbles 4 flies 4 walks 2	to fly 3 walks 3 to swim 4 lay (eggs) flying to bathe	to walk to fly 2 swim	to swim 4 to fly 5 "
Ducks are used for (object)	food "	meat food	food 3 meat	food	
What one does to ducks	" " "	to kill  to eat to breed	to sell 3  to breed "	to take care of to take to eat 3 to marinate	to eat 6 to breed to sell
Uninterpretable	spread out " "	pineapple stick 2 to raise	spread out stick solar sick	candle sprout "	to spread out to paint "

changes wrought by age or schooling represent transformation in basic thought units in the sense previously discussed demonstrates that by changing the context of

elicitation, differing pictures of the lexical organization of the same words can emerge. So, for example, when noneducated people who demonstrate situational-



concrete associations in a free association or object sorting study are presented the same words in sentence frames and asked to make judgements about the acceptability of the sentences produced, the pattern of their responses shows clearly that they are reproducing a "verbal-logical" hierarchy of word meanings (Cole, Gay, Glick, & Sharp, 1971).

*Taking another look.* It is almost certainly possible to reconcile these data on variable lexical organization with modified versions of a transformational, developmental theory. These theories are ambiguous about the cognitive status of lower stages, and expansion from existing assumptions to account for the conditions under which they will come to control behavior is one normal line of approach on the existing anomalies. But there are good reasons for arguing that a reformulation of the entire set of issues be attempted.

To begin with, recent debates on the nature of conceptual change have made clear the difficulties of arguing that qualitatively new and more powerful structures of intellect emerge *at the level of basic units* [which is what the word represents in Luria's system of the schema in Rumelhart and Norman's (1980) system]. These arguments have been summarized (by Fodor, 1975; Keil, 1981) and need not be gone over here. However, the underlying message is clear: in some sense, the competencies underlying adult conception must be present at birth. Conceptual change can only be change in the functional organization of existing conceptual systems. New functional configurations exploit pre-existing possibilities in the phylogenetically coded possibilities of homo sapiens' interaction with its niche in nature.

This point of view extends beyond arguments over the nature of language considered in the narrow sense into a re-evaluation of the nature of conceptual development more generally. What began in the 1960's as a theoretical argument between constructivists and behaviorists over the factors controlling conceptual development has blossomed into a new, as yet poorly articulated, counter-framework. Empirically, research is discovering the existence of cognitive sophistication in younger and younger children (Gelman, 1978; Mandler, 1981 and *passim*). It is doing so by adapting strategies of research that insinuate themselves into the flow the child's interactions with the world under conditions that are as close to natural as possible (French & Nelson, 1982). As Donaldson (1980) so nicely puts it, experimental arrangements should make as much "human sense" as possible, so that factors other than those relevant to the focal activity do not flood the system.

Finally, this point of view is consistent with that tradition of cross-cultural research on cognition which interprets cultural differences in terms of the different functional activity systems that organize a universal set of basic conceptual competencies (Hutchins, 1980; Laboratory of Comparative Human Cognition, in press(a), in press(b); Scribner & Cole, 1981). The substance of this alternative approach can be illustrated by reconsidering the data in Figure 2 and the circumstances under which they were collected.

*An alternative explanation.* A person comes to you and tells you that you are supposed to say the first thing that comes to mind when he pronounces each of a set of words. The description of the experiment includes

the written instructions, and something about the institutional setting. But what about the subject's interpretation of the request? Won't it be important in determining the nature of the words he thinks of first? Luria certainly thought so. He built a lie detector system on the notion that one could learn a great deal about underlying cognitive organization depending upon the interpretation that individuals put on a specific word. One could even use this information ("covertly preserved") to construct a lie detector (Luria, 1979).

How would we apply this line of reasoning to the school/nonschool comparison? We might ask, "Has this person ever encountered anything like the task I am posing?" If they have encountered something like the task we are posing, we might want to investigate its structure to see what it could tell us about what the subject was likely to do. In Luria's terms, we might want to find out when different kinds of organization are considered important enough to use in guiding behavior.

Here we come upon a central paradox in this enterprise. Schooling is an historically accumulated set of activities which has as its general function the preparation of immature humans to adopt adult mature human roles. Among the wide variety of systems of enculturation, the participants in discussions of the influences of schooling usually have in mind a multi-year curriculum more or less based on the model extant in our public schools today. That is, children attend classes where 25-30 children are instructed by an adult. Instruction focuses on literacy and numeracy as essential tools for acquiring knowledge and operating the technical and bureaucratic affairs of an industrialized or industrializing country. Whatever other functions a school may fulfill (and they are many) practice in manipulating information through operations on language (directly or through writing) is a central basis for evaluating success.

When we approach two men to participate in our experiment, we encounter people who differ in several respects with regard to information they can draw on to interpret our instructions.

First, the educated subjects have a great deal more encounters with *words*. Whatever else goes on at school, there is a lot of talk. Moreover, it is talk about common objects entering into diverse relations that are perfectly interpretable as concrete events ("José gave a banana to Lupita") except that the reader might not know a José or a Lupita. While this situation might cause a little confusion at first, a few pages into his/her first primer and the novice will begin to realize that books are about "any old" José and Lupita. Books are about words. So is a lot of the rest of the curriculum. Nor do words have to make any particular human sense; they have to make school sense. Later on we learn what it is about.

When we approach a person who has had such experiences he of course wants to know who we are and what we are doing. We explain ourselves. We are there to help improve the education of children. Education, all agree, is a good thing, so people cooperate with us. When we give our instructions they seem to understand what we want. They respond to each word we present as if they understood our instructions to be "When I say a word, tell me the first *word* that comes to mind." They seem to be invoking school as the context to interpret the experiment. Like their encounters with



school-like activities, the experiment is about *words*. They respond with words appropriate to the context as they interpret it.

The uneducated subjects had also heard of school, and they had some notion of what we meant when we spoke to them about improving their children's education. But they had little experience with interactions mediated by print and the kinds of content areas of the curriculum that foster extensive commerce with words in multiple contexts. They too seemed to understand our instructions, responding readily with words in response to stimulus words. Significantly, the words that they gave are themselves evidence that the subjects' understanding of the task overlapped considerably with the experimenter's: only a few words are not readily categorizable in terms of their semantic relations to the stimulus word (and in those few cases, our limited knowledge of Spanish and Maya may have induced a wrong identification of the word). Yet the context evoked by these subjects was not school (not too surprisingly since they have experienced little enough of it long enough ago to make it seem remote). Rather, it seemed to be other contexts where, in daily life, one encounters the object named. Instead of providing words that are similar to the words offered by the experimenter, the nonschooled subjects appear to be describing objects that are named by the experimenter in terms of the empirical events within which the objects are embedded.

The reader who finds this kind of explanation plausible may well be moved to shake her head over the difficulty of doing clean experiments in cognitive psychology, and the bore that methodological purity often represents. Not a little of our own work has been an exploration of the limitations on generalizations that comparative cognitive data permit (summarized in Cole and Means, 1981).

We postponed the discussion until we had motivated differing theoretical interpretations of the basic phenomenon, because we see no way of deciding deep theoretical divisions on the basis of a theory-free method. If, as we propose, the basic conceptual "building blocks" that characterize all presumed stages of conception are there from the beginning, what kind of theory of development is implied and how does schooling contribute to the manifest changes in the structure of mediated activity that characterizes adults and children in ours and other societies?

*Standing Luria on his head.* We have chosen Luria as a foil for this discussion because he lays out the developmental position so neatly in his work. He also offers the basis for the reformulation that we need. In the work already referred to, and in the work of others in Vygotsky's school who have grappled with the shortcomings of the originators' work, we have the basis for a multilineal theory of development which is culturally guided and biologically constrained.

The starting point for such a reformulation is Luria's recognition that new developments do not *replace* old ones, they reorganize the functional organization into which previously present elements enter. In simplest terms, what Luria takes to be transformational changes in the basic elements of thought are transformations in the systems of mediated interaction of which the individual is a part.

Luria's own examples are a good starting point. He says that an "affective sense is the essence of the word's meaning." We can understand this as follows: if a child has seen a dog only once and was terrified by it, and has learned that "dog" applies to the creature, the strong affect of the original event may well be dominant in the child's understanding of "dog." But there is no reason to take this example as typical of all lexical items in the child's vocabulary. In order to "respond affectly" to the word dog, the child is also demonstrating recall of a concrete situation and is abstracting features of that situation which correspond (according to some mapping, not necessarily the adults') to the prior events. That is, "concrete-situational" and "abstract" aspects of the concept were co-present in the child's representation, but not dominant as evoked.

The same holds true for the next stage, when the word "dog" is said to evoke the memory of a concrete experience ("a dog keeping thieves away"); this description of a memory is itself an abstraction, yet one in which affective components are easy to imagine. Luria need not say that "a concrete image has replaced affective connotations." He has good evidence to show that the system replaced remains in the person's repertoire. From the work of ingenious cognitive psychologists we know that the systems presumably "acquired" are present from the beginning. Thus the task becomes to account for the transformations in the functional organization of activity during ontogeny. In the present case, we want to understand schooling as a distinctive form of activity. Once we have some notion of schooling's special properties as a system of activities, we can ask what functional cognitive systems it promotes, and the role of these systems in other domains of activity.

Posed in this general fashion, the issue of schooling influences on conception opens onto a discussion of the role of schooling in society. To avoid yet another vast sea of uncertainties, we can reduce schooling to its bare-bones essentials: schools are contexts set aside from other activities where adults teach children skills that are assumed of universal relevance to adult practices in *other contexts*. Schools as contexts are distinguished by the organization of social interaction, the tools and materials that are required to obtain information about what one needs to do in order to fill various social roles, and the incentives for trying.

Virtually since their beginning, organized around literate practices, schools have placed enormous value on lists of objects. Represented in graphic form, these lists allowed new forms of inspection, because the representations were relatively fixed in time and space. This functional reorganization of information and problem solving led to the use of new criteria of grouping, criteria we recognize as systematizing, and became a central part of the technological armorarium with which we address the world. But even at the beginning, before the invention of the alphabet or typography, schooling perpetuated the dream that Man could get a catalogue of all the world's contents, which when properly classified and memorized would represent full knowledge of the world. As ludicrous as it may appear now, an ancient Egyptian scribe who had listed all of the known world's objects by name and categorized them into nine broad classes could declare that the



manuscript was a "Beginning of the teaching for clearing the mind, for instruction of the ignorant and for learning all things that exist." (quoted in Goody, 1977, p. 101).

So, perhaps we could agree that schools are a place where a special kind of activity goes on. It is an activity that involves exchanges mediated more by words than by objects, although these exchanges have been arranged by the society for the purpose of allowing people better to operate on objects in non-school contexts. Among activities largely mediated by words, schooling is distinguished by a set of practices designed to teach specific skills involving language and extensions of language in the form of writing and numeracy.

From the current perspective, resolutions of questions about the influence of schooling always depend jointly upon the context in which the activity is acquired and the context of application. Following Friere (1970), we can conceive of schooling as a social process involving activities in two contexts, the "theoretical context of dialogue between teacher and learner" and the "real, concrete context of facts, the social reality in which men exist." Within each of these contexts, language plays an important, *but different* role. In the theoretical context, one's practices involve manipulations on words. This teaches us more about words and more about manipulating them. We learn ways to remember long lists, to search for connections between concepts where no connection is obvious (except in the teacher's expectation that we will find one if we work hard enough). In some instantiations, it teaches that "meaning is in the text" (Olson, 1977) and it promotes modes of discourse in which the structure of written text enters into the structure of speech (Greenfield, 1972).

The structure of communication that characterizes the theoretical context constrains the conceptual processes characteristic of schooling. It shapes the characteristic cognitive activity of the school context, which leads neo-Vygotskian scholars to declare that "Theoretical thinking is . . . the new psychological structure that emerges at primary school age." (Markova, 1979) (assuming a society in which schooling has the characteristics of contemporary industrial societies). Bartlett (1958) characterizes these activities as "closed system," "experimental" thinking, in which systematic search and comparison procedures are the norm. As many have pointed out, the procedures of the school are designed to allow the assessment of individual achievement, or its darker side, failure.

What about the other contexts that people find themselves in, those contexts which we so glibly gloss as "everyday life," those contexts from which schooling was separated in the first place? Obviously no single contrast can capture the richness of the distinction we are trying to make; rather, for each way in which we claim something characteristic of schooling, there is a potential contrast with other systems of interaction. The clear implication of the work we have been referring to is that activity is mediated by language in a different way: partialling achievements between participants is no longer a necessarily prominent aspect of interactions, social flexibility in bringing information to bear on a problem is far greater, the goals of the activity are likely to bear a more direct relationship to individual actions than is true of schooling, and except in special cases,

writing and language are not so clearly organized to manipulate words in the absence of manipulations on objects and people.

### Some summary considerations

We are currently in the process of exploring the implications of the position we have been outlining here. Going back, for a moment, to the four generalizations about schooling effects that we offered at the outset, we can feel comfortable that we have not done violence to the facts. In those cases where the goals of the activity arranged by an experimenter conform to everyday goal structures, we expect performance to increase with age. In those cases where the goals of the activity arranged by the experimenter conform to structures which are specific to schooling, we expect exposure to schooling to influence the organization of cognitive activity. The resulting pattern of school/non-school differences will depend upon features of the contexts and activities that are tapped by the experimental task. In some cases features of the discourse mode (Scribner, 1977), in other cases familiarity with specific materials or optimum processing strategies will be seen to shape the specific functional organization of activity.

Although our account of schooling influences may not do violence to the facts, it may also be argued that it hasn't done much to raise us above the facts. To the question, "what is schooling's influence on concept formation" we have answered "it changes the mix of cognitive organizing principles that guide peoples' actions, depending upon the contexts in which they find themselves." This answer commits us to a study of the relation among contexts to which schooling is connected as a social institution as well as a description of cognitive activity in those contexts. It's a long and difficult enterprise as generations of anthropologists can attest. However, it is not a road that we are traveling from the beginning. We have offered a reinterpretation of a developmental theory that shifts the basic unit of analysis. It does not deny the centrality of language in the process of the development of new functional activity systems. Rather, it focuses our attention on the factors that control which organizational principles are appropriate. The data speak unequivocally on one issue. Schooling provides increased experience with language. Language is the storehouse of the theories accumulated in human experience to account for experience of the world. Access to the experience of schooling is access to a treasure trove of tools for dealing with our lives. What influence schooling exerts will depend jointly on our access to the tools and the raw materials (e.g., non-school real world contexts) within which to tinker with our (k)new-found possibilities.

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